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SUPREME COURT OF THE UNITED STATES

OCTOBER TERM, A. D. 1902.

No. 148.

KOKOMO FENCE MACHINE COMPANY,
Petitioner,

vs.

ALVA L. KITSELMAN AND DAVIS M. KITSELMAN,
Respondents.

BRIEF FOR RESPONDENTS

(COMPLAINANTS AND APPELLANTS BELOW.)

STATEMENT.

This cause was brought here by petition of the Kokomo Fence Machine Company (defendant and appellee below) for writ of *certiorari*. Upon the grant of such writ, a cross-petition seeking relief in addition to that which had been granted below, was filed and granted in behalf of respondents, who were the complainants in the circuit court and the appellants in the circuit court of appeals. The suit was brought in the circuit court, district of Indiana, for infringement of four patents under which Kitselman Brothers, complainants below, are manufacturing a machine adapted to weave wire fence in the field as well as in the shop, that is to say, a machine that fabricates woven-wire fence in position for use along the posts which support it, or, as witnesses have aptly expressed it, *"in situ."* The patents sued upon are the Davisson, No. 289,507, granted December 4, 1883, for "Machine for Making Wire Fabrics," and assigned to complainants; the Kitselman, No. 356,322, for "Wire Fabric Machine," granted complainants for an invention of Alva L. Kitselman (one of complainants) January 18, 1887; the Conner, No. 357,067, for "Machine for Forming Netted Wire Fabrics," granted February 1, 1887, and assigned to complainants,

and the Pope, No. 505,607, for "Wire Fabric Machine," granted complainants as assignee of John C. Pope, September 26, 1893.

The Kitselman patent was the first to create any machine capable of weaving a fence along the posts upon which it is to remain, and immediately upon its issue machines built under and in accordance with it went rapidly into use, and have ever since continued in extensive use. It was built upon a plan which gave it great advantages over previous looms or weaving machines for weaving wire fabric in the shop, but these advantages were overshadowed by the fact that it created a machine with which the farmer could weave his own fence when and where it was wanted, adapting it as woven to the varying surfaces over which it extended and maintaining in the completed fence, throughout its length, the initial tension imparted in the act of weaving, securing a fence differing in character and vastly superior to any obtainable by weaving the mesh elsewhere and thereafter hanging it on its posts. The Kitselmans, to whom this patent was granted (to Alva L. Kitselman as inventor and Davis M. Kitselman as assignee of one-third interest) began its manufacture on a commercial scale about the time the patent issued (the patent being dated January 18, 1887), and have continued its manufacture ever since, soon building up an extensive industry. Their exclusive right was respected until the Kokomo Fence Machine Company (the petitioner here) was organized in 1896, by men who had been employed in and about the Kitselman factory where the patented machines were made and sold, for the express purpose of manufacturing the defendants' machine here in evidence, a substantial copy of the Kitselman machine with formal or subordinate changes which retained the essential character, relationship and operation of each of the elements constituting the machine. Due notice of infringement having been given and disregarded, this suit was promptly brought and prosecuted.

The Davisson patent had introduced a new and valuable invention in machines for weaving wire fabric which was incorporated in the Kitselman machine with such improvements as, while retaining its advantages, qualified it for the additional purposes of the Kitselman patent. To secure protection in respect to this, the Kitselmans purchased the Davisson patent. The Conner patent, shortly subsequent to the Kitselman, and the later Pope patent, introduced certain improvements which were adapted to use on the Kitselman machine. These patents were purchased by the Kitselmans, and many of their machines since such purchase have included these improvements, though many have been made and sold constructed exactly as shown in the Kitselman patent without subsequent improvement of any kind. The Kokomo Fence Machine Company

began its manufacture of fence machines after all these improvements had been patented, and, in copying, it included them. Hence, the charge of infringement was made under the four patents. The hearing on circuit was before his Honor John H. Baker, district judge, who, laying stress on formal or subordinate differences between the construction of the constituent elements of the defendants' machine and the illustrations of the corresponding elements in the patent in suit, found that there was no infringement, and ordered the bill dismissed on that ground. Complainants thereupon appealed, and the circuit court of appeals for the seventh circuit reversed the decree below, and adjudged defendants' machine an infringement of the Kitselman patent. (*See opinion, R., pp.* 549-554.) The opinion recognized the originality and comprehensive character of the Davisson invention, and apparently considered it as included in defendants' machine. It plainly held the Kitselman patent valid and infringed. The opinion appeared to proceed upon the assumption that in view of the comprehensive relief granted, it was unnecessary to consider the two later patents sued upon. Judge Woods noted his dissent to the opinion, but stated no reasons therefor. After mandate was filed in the circuit court, a petition for writ of certiorari was filed here by the Kokomo Fence Machine Company and other proceedings had, as before stated.

Kitselman Brothers, the original complainants, insist that the judgment in the court of appeals was correct in reversing the circuit court and ordering a decree for complainants under the Kitselman patent, but that it should have gone further than this and specifically ordered a decree in favor of complainants under each of the patents in suit, against all the defendants.

The patents are in evidence under the titles, respectively, "Kitselman Patent" (*R., p.* 384), "Davisson Patent" (*R., p.* 404), "Conner Patent" (*R., p.* 398), "Pope Patent" (*R., p.* 409). The claims charged to be infringed are the first, second, ninth, tenth, eleventh, fifteenth and twentieth of the Kitselman patent, the second and third of the Davisson, the second and third of the Conner and the first, ninth and tenth of the Pope. Defendants' machine is in evidence as "Complainants' Exhibit Defendants' Machine," and is shown to be one of the machines manufactured by the defendants and to represent machines which have been manufactured and sold by them at Kokomo, Ind., ever since shortly after the incorporation of the defendant company in 1896, and the only style of machine that has ever been manufactured by that company. (*Stipulation, R., pp.* 21, 22; *dep. John E. Frederick, p.* 22, *A.* 6-8; *p.* 28, *A.* 78, 79.)

The Kitselman machine as first put upon the market by com-

plainants about the date of the Kitselman patent and manufactured and sold by them ever since, is in evidence as "Complainants' Exhibit Kitselman Machine No. 1." The improved machine manufactured by the complainant with the Pope invention included therein is in evidence as "Complainants' Exhibit Kitselman Machine No. 2," and the machine manufactured by complainants embodying the inventions of all four patents as "Complainants' Exhibit Kitselman Machine No. 3." (*See dep. Kitselman, R., p.* 88, *A.* 6; *p.* 90, *A.* 18-19.)

Notice of the infringement charged was promptly given to defendants, in writing on or about July 14, 1896. (*R. p.* 19.)

All the defendants joined in an answer, which alleged anticipation by numerous prior patents therein recited, and denied that they had "manufactured or sold wire fabric machines copied after the complainants' machines and which embody or contain the alleged inventions and improvements covered and secured in and under said several letters patent, or any or either of them." The bill had charged infringment "by manufacturing at said Kokomo, Indiana, and selling and putting into use there and elsewhere in the United States," etc. While the denial in the answer is not as comprehensive as the charge and does not refer specifically to the putting into use, it is probably intended to be a general denial in this respect.

In support of this answer, defendants have offered in evidence some of the patents recited, and have called an expert, who argues that the claims sued upon ought to be treated as limited by the prior art to the exact construction of each of the elements illustrated in the patents, and that, so limited, they would not be infringed by defendants' machine. This expert admits, under cross-examination, that he has never seen any machine constructed in accordance with either of the prior patents upon which he relies, or, in fact, any machine for manufacturing wire mesh fence except the complainants' and defendants' machines here in evidence and a recent machine against which complainants have within the past few months brought a suit for infringement. (*Dep. Wiles, R., p.* 172, *A.* 8-13: *dep. Kitselman, R., p.* 331, *A.* 1-8; *and Stipulation p.* 333.)

Complainants' experts, on the other hand, (both Mr. Dayton and Mr. See), testify that the prior patents relied upon by defendants' experts emphasize the fundamental character of these inventions, especially of the Davisson and of the Kitselman, and exhibit nothing analogous to them or adapted to serve their purpose, or that tends to limit or qualify the claims in suit; that complainants' machine is a radical departure from anything found in the prior art; that defendants' machine has adopted and embodied the inventions covered by each of the claims in controversy, disguising some of

these elements by formal changes which in no wise relieve them of the essential character upon which the claims rest; that complainants' inventions which the defendants have thus appropriated are of exceptional value, and have practically created a ne wart. They give their reasons for the opinions expressed, and point out some of the errors into which defendants' expert has fallen. (*See dep. Dayton, R., p. 32 et seq.; dep. See, R., p. 185 et seq.; and second dep. Dayton, R., p. 26 et seq.*)

It is contended in behalf of the respondents (complainants-appellants) that the record plainly establishes the following facts:

First. That the inventions embraced in the claims in suit created a machine of essentially novel character, serving purposes of which no prior machine was capable, while at the same time possessing the alternative capacity of performing the work of prior machines without the complicated mechanism upon which they were dependent; that complainants have, through these inventions, founded a distinctive industry, and for the first time enabled farmers to weave wire mesh fence for themselves in the position which it is to occupy; that they have further endowed this machine with the capacity to make, at the will of the operator, either the fence of novel character, exceptionally stable and efficient, for which it is peculiarly adapted, or other varieties of fence which had been before constructed by other machinery lacking the special advantages of this, and that the machines thus created and placed upon the market by complainants proved a prompt and permanent success and have gone into very extensive use.

Second. That defendants, being familiar with complainants' machine and the success attending it, have combined and incorporated to manufacture, sell and put into use a substantial copy thereof, embracing the inventions of each of the claims in controversy, disguising their imitation by some formal variations which do not depart from the substance of such inventions or avoid the terms or effect of the claims.

Third. That the prior patents invoked by defendants show no approach to the patented inventions, but rather emphasize the originality of conception and organization involved in them; and that it is only by disregarding the actual construction and operation of the machines shown in these prior patents, and artfully reading into them modifications which they do not exhibit or suggest, that defendants' expert has given any plausibility to his attack.

ASSIGNMENT OF ERRORS.

It is submitted that the United States circuit court of appeals for the seventh circuit erred—

First. In failing to adjudge that the Davisson patent here in suit was good and valid and the property of complainants; that said Kokomo Fence Machine Company had infringed complainants' exclusive right thereunder, and particularly the second and third claims thereof, and to grant complainants an account of profits and damages thereunder.

Second. In failing to adjudge that the Connor patent here in suit was good and valid and the property of complainants; that said Kokomo Fence Machine Company had infringed complainants' exclusive rights thereunder, and particularly the second and third claims thereof, and to grant complainants an injunction and account of profits and damages thereunder.

Third. In failing to adjudge that the Pope patent here in suit was good and valid and the property of complainants; that said Kokomo Fence Machine Company had infringed complainants' exclusive rights thereunder, and particularly the first, ninth and tenth claims thereof, and to grant complainants an injunction and account of profits and damages thereunder.

Fourth. In failing to find and adjudge that the complainants' exclusive rights under each of the patents set forth in the bill had been infringed by the defendants, and to grant an injunction and accout of profits and damages thereunder against the defendant company, its officers and stockholders, and each of them.

THE PATENTED INVENTIONS.

Distinctive Originality of Machine.

If stress is laid upon the peculiar capacities with which the patented machine is endowed, it does not mean that complainants are asking to have their patents construed as covering these results or advantages, as distingushed from the inventions by which they are obtained, but rather that the essential character of the elements composing the machine are best understood when regarded in the light of what they accomplish. When reference is made to the fact that the Kitselman machine was the first machine of any kind adapted to weave a meshed fence *in situ*, this does not mean, merely, that these machines were distinguished from prior ones by possessing the capacity for locomotion ,or by being so reduced in bulk or weight as

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to permit their ready transportation. It is not such changes as these that constitute the inventions here asserted. There was no prior machine which by any change of proportions compatible with its practical use, or by providing it with means of locomotion, could be adapted to such purpose. The capacity and adaptation of the Kitselman machine is due to the discovery that the weaving of such fence could be accomplished by means which dispensed with the complicated and necessarily cumbrous mechanism which, prior to these inventions, constituted the only known mechanical means of weaving wire mesh of the requisite character, and to the construction of such machine on a plan fundamentally distinct from any exhibited in the prior machines or patents. Some, if not all, of the inventions here in controversy are available and valuable for weaving wire mesh in the shop, as well as in the field, and have most important advantages over prior machines when used for this purpose. They can also be used either in the shop or the field in the production of other wire meshes or fences than those for which they are peculiarly adapted. But, to appreciate these inventions, and the significance of the elements constituting them, it should be kept in mind that they brought into existence a machine which had not only the capacity of doing certain old things better and more economically than they could be done by any prior machinery, but the further capacity of doing certain other useful things which no prior machine could do, which had never been done by any means before, and which enabled the farmer to almost automatically weave in permanent position, a stable and peculiarly efficient meshed wire fence, with only such power as could be easily applied by hand; and that there has thus been introduced extensively a new method of fencing at once economical, efficient and conveniently available to the farmer and others—producing a fence that serves a great variety of purposes better, probably, than any other fence that is obtainable within the necessary economic limits.

That no prior machine could have been adapted to such purpose by any change short of rejecting the fundamental plan of its construction and contriving an essentially different one, is conclusively shown by the record. That the Kitselmans were the first to accomplish this was affirmatively shown in complainants' opening evidence, and not disputed by defendants' evidence. (*Dep. Kitselman, p.* 39, *A.* 12.) That these complainants, starting their little factory at Ridgeville, Indiana, had, within a few years, increased their output of such machines to over five thousand a year, (*dep. Kitselman, R., p.* 89, *A.* 8), is impressive evidence of its utility. Further evidence of its utility is found in the fact, shown by evidence cited under the title of "Infringement," that the defendants,

who were personally familiar with complainants' machine and its achievement, combined for the express purpose of competing in the manufacture and sale of one so closely copied after it that it does not exhibit a single improvement upon it, or introduce any new function or advantage.

Mr. Dayton, who has seen these machines in use, says of the inventions embraced in the claims in suit (*R.*, *p.* 52, *A.* 8.)

> "They are practically and successfully operative, they are operative together and they constitute progressively operative development of great practical utility and value in the manufacture of meshed wire fencing."

The simplicity and aptness with which an ingenious machine meets conflicting conditions often mislead those uninitiated in the perplexities of invention into assuming that the solution of the problem revealed by the completed machine was equally obvious before its creation.

A person who had never undertaken to weave wire mesh, and never witnessed the operation or studied this art, can have little idea of the difficulties which have been encountered and the complications of machinery before resorted to in order to overcome difficulties which are eliminated by the inventions embraced in the claims in suit.

Some reference to these difficulties and the complex and ineffectual expedients resorted to (exhibited in the prior patents selected by defendants' expert as showing the nearest approaches) will illustrate the departure made by these inventions and the difference between after-sight and fore-sight, as applied to this art. This departure is well explained by Mr. See, who, after examining the evidence introduced for defendants, says, referring to the patents in suit (*R.*, *p.* 186):

> "This chain of inventions has opened up the possibility of a practical and satisfactory machine adapted for use in the field in building *in situ* a wire fence formed of a peculiar fabric and representing the ideal cheap, handsome, efficient home-made metallic fence. Without the inventions represented by the patents in suit this would have been impossible. . . .

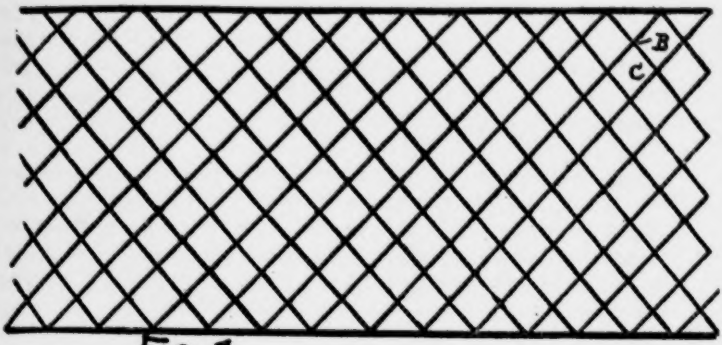


FIG. 1.

"Fig. 1, above, represents a very ordinary old form of wire netting, woven in the factory on power looms and then rolled up and sold to farmers who employed it for fencing by stretching it up against fence posts and securing it thereto by wire staples driven into the posts. The top and bottom wires are heavier than the wires forming the diamond meshes and it is these top and bottom wires which bear the longitudinal strains of the fence and furnish its entire stability. The entire weight of the fence, considered as a suspended structure, is borne by the top wire. Such a fence has a fair amount of traverse strength only at its upper and lower edges, the main intermediate portion of the fabric being comparatively weak and incapable of resisting serious attacks by animals, and also much subject to buckling and bagging under the effect of weight and wind. No great stability can be expected from such a fence even with the posts set rather close together. And when it is considered that in many cases the fencing of land may cost more than the land itself, we are able to appreciate the high importance of economy in posts. We can readily appreciate the difference in economy found in a fence having its posts twenty feet apart as against one having its posts eight feet apart. And when it is considered that it is the duty of a fence to furnish resistance to attack and to natural causes tending to disorder or destrop it, we can appreciate the importance of economizing in the wire by getting the utmost of resistant capacity out of every ounce of it. In the fence above pictured, it is obvious that the top wire stands for the stability of the fence and that hence that wire must be very heavy if a good fence is desired.

"The above sketch does not pretend to show the details of the weave, and it might at first glance be supposed that the

diagonal wires ran continuously diagonally from the top to the bottom wire, merely crossing the intermedate wires. But that is not the case. The diagonal wires are not continuous, and they do not cross, but are twisted together. For instance, a diagonal wire traced from the point A is found twisted two or three times around the top wire and then going down to B where it is twisted two or three times around the wire coming up from C, the wire then going up again to the top wire around which it twists at D, and so on, the wire zigzagging up and down from the top wire to the intersections just below the top wire. And, similarly, wire C zig-zags up and down to twisting intersections with the wires above and below. The diagonal wires are thus seen to be formed of longitudinally extending wires deflected up and down to meet their neighbors, twistings being formed at the meeting points. This system of zigzags and twisting intersections applies to most all of the fence fabrics which it will become necessary to consider in the present controversy. Mr. Wiles has correctly understood this fabric, but he has failed to appreciate, or at least point out, its inherent weakness as a fabric for farm fences.

"In recognition of the inherent weakness in fences formed of the above fabric it has, I understand, been the custom to sometimes reinforce the fence by stretching supplemental wires along it at various heights after it was erected, and fastening such supplemental wires to the post. These supplemental wires gave increased transverse stability to the fence, but on their own account only, and they did not serve in supporting any of the weight of the fence or in stiffening the diamond fabric except in one direction, nothing preventing the wind or other agencies from pushing the diamond fabric away from these supplemental wires.

"For the sake of a brief name, I will call the above fabric 'Simple Net Fencing,' and when I use this term the mind should go back to Fig. 1 and to a recollection of the inherent weaknesses of the fabric as a fence material.

"An improvement has been suggested in this class of fences designed to somewhat compensate for the defects in the simple net fencing. This will be understood from Fig. 2.

"Notice in Fig. 2 that the upper portion of the fence is nothing but a piece of simple net fencing, with its top and bottom wires, and notice that the lower portion of the fence is also a piece of simple net fencing with its top and bottom wires, the bottom wire of the upper portion serving as the top wire for the lower portion. When such a fabric is properly nailed to the posts it will obviously have advantages due to an inter-

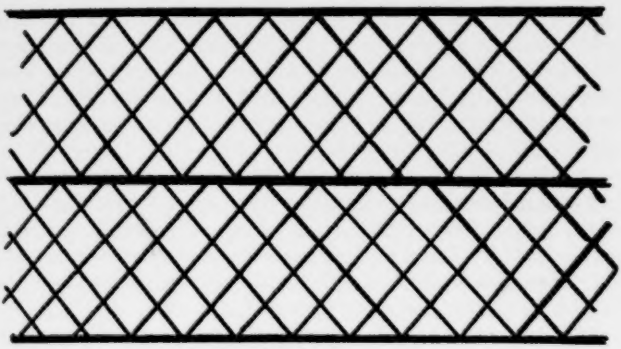


FIG. 2.

mediate wire incorporated in the fabric itself. But notice that the diagonal wires are not twisted together at the intermediate wire, but that, on the other hand, the diamonds break joint at this wire and have no connection with each other and merely engage the longitudinal wire. Thus either portion of this fabric would be capable of slipping with relation to the other portion a distance represented by half the length of the diamond, and, also, there is a lack of continuity in the diagonal lines of strain where those lines cross the intermediate wire, the diagonal wires all being offset a half diamond in distance at said intermediate wire. Such fabric is in the market for fencing and is made on machines invented by a Mr. Sedgwick. As the fabric represents two parallel sections of simple net fencing, I will, for a brief name, call it 'Sedgwick's Twin Netting.' Mr. Wiles, in considering the Sedgwick machines, has failed to understand their manner of working and their product.

"Fabrics like the simple net fencing and the Sedgwick twin netting above referred to was woven, if the process could be called weaving, in large stationary looms operated by power. The longitudinal wires forming the edges of the fabric, and also the intermediate wire, if there was such wire, would be led from stationary reels through the machine and then to a take-up cylinder or roll, these wires being strained and constituting the warp of the fabric. The wires of which the meshes were to be formed, constituting the woof wires of the fabric, were then led from reels and through the machine and to the same take-up cylinder. The operation of the machine would result in the zig-zagging and twisting of the woof wires so as to form a series of diamond meshes extending acros the fabric,

whereupon the take-up cylinder would be given a partial turn so as to reel up so much of the fabric as had been produced, after which the operation would be repeated, and so on and on, the completed fabric being rolled up on the take-up cylinder from which it was eventually removed for storage and shipment and use.

"These looms were heavy and costly and complicated and took considerable power to run them and they were very bulky. But, being fixed factory machines, the weight and cost and bulk was not a serious consequence, nor was the complication, in view of the fact that the machines were used in factories under the eyes of skilled operators.

"In all these old looms there was involved one feature of mechanism, essential in the principle of construction of the machines, which resulted in the complication. I may or may not be able to make the matter plain. I have reference to the manner in which the woof wires were led to the machine and dealt with therein. I will try and describe an elemental machine illustrating the principle of these old looms. Imagine three woof wires stretched from their reels to the roller on which the fabric is to be wound. Now, near the roller, deflect the middle wire sidewise to one of the side wires and twist these two wires together. Then move back a space and deflect it to the other side wire and intertwist it with that wire, and then back to the other wire, and so on, thus zig-zagging the central wire and producing two series of half diamonds. Notice what happens in making the twists, regardless of how the twisting is done, and for the present we may assume that the twisting is done by hand, by means of a pair of plyers. Move the central wire over to a side wire and begin the twisting operation, that is to say, give the middle wire two or three turns around the side wire. This may be easy enough, and the twists may be satisfactorily produced, but it will at once become evident that there is trouble in the rear, for the wire between the twisting and the reels has become tangled up and twisted. Twisting is wanted just where the twisting is being done, and nowhere else, but it is found that the result of the twisting is that the wire leading back to the reel partakes of the twisting action and gets into trouble. This has not prevented the proper twist from being made, but when that twist is completed and an attempt is made to carry the wire over to the other side wire it is found that the rear of the central wire has become twisted up with the first side wire and will not part company with it so as to be deflected to the second side wire. It becomes necessary to separate the rear wires by a reverse twisting operation. This

rearward entanglement is so serious as to be fatal in making wire netting, and it became necessary to provide machinery between the reels and the desired twisting points to guard against this rear twisting. In the assumed case of our elementary loom, let us assume that a man has deflected the central wire to the side wire and is making the desired twist. He finds the rear of his wire wrapping around the side wire, a wrapping which must be prevented. He sends another man to the reel which contains the central wire, and instructs him to pick up that reel and carry it round and round the side wire so that as the real twisting takes place there will be no twisting at the rear of that point. In short, the reel carrying the woof wire is given an orbital or revolving motion to compensate for and prevent its undesirable twisting at the rear. In the old loom for making wire netting there was arranged the twisting mechanism to produce the desired deflections of the wire and the desired twisting of the wires, this mechanism corresponding in function with the twister man who has been referred to. The twisting mechanism involved a row of twisting devices, the series including as many twisters as corresponded with the number of diamonds forming the width of the fabric. This mechanism was arranged to deflect the wires and do the twisting, and might be called the twisting machine. Back beyond the twisting machine, and between the twisters and the reels from which the wire was drawn, was mechanism to give the woof wires and their reels the compensating orbital motion to prevent the rear twisting which I have referred to, such rear mechanism corresponding in function with the second man I have referred to. This rear mechanism, having no office in the twisting or in the formation of the fabric proper, and having only to see that the wires are properly fed to the twisters without any rear entanglement, might be called the feeding mechanism. The loom thus essentially comprises a twisting mechanism and a feeding mechanism and, so far as I know, all the old looms for wire netting, which were capable of any practical success, were thus made. The double character of the mechanism involved essentially in these old looms was due to their fundamental principle of construction, due to the fact that the twisters were placed in front of the reels. Take any two parallel strings under strain and start to intertwist them at the middle by revolving both together, and you will notice the twisting takes place at the north and south of the point of attack by the fingers which do the twisting. In making wire netting it is the north twisting which is wanted, and the south twisting becomes mere fatal entanglement. Mr. Wiles appears

to have quite overlooked this matter and to have failed to comprehend the fact that prior to the time of the patents in suit there were no netting looms for this wire fabric which did not involve this undesired rear twisting and the second mechanism or feeding mechanism for preventing it. It is this double system of machinery of feeding and twisting, which leads to the complexity and bulkiness of the old looms.

"The first of the patents in suit, the Davisson patent, revolutionized the construction of netting looms, obviating the necessity for the rear feeding or twist-preventing mechanism by a system of construction which entirely prevented the tendency to form these rear entangling twists. To put it in another way, Davisson avoided the rear entangling twists, and all the machinery usually employed to deal with those entangling twists, by the heroic expedient of not having any rear to his system. The troublesome twists in question took place between the twisters and the reels from which were fed the woof wires, that is to say, to the rear of the twisters. Davisson abandoned the rear of the system by transferring his reels bodily to the front of the mechanism which drove the twisters, thus putting the reels right on the fighting line and making them themselves take part in the real twisting work. Then, for the first time in the art, here was no troublesome rear, and no necessity for rear twist-preventing feeder mechanism.

"Davisson's radical departure cut off the offending member, and improved and simplified the machine. Davisson's machine was a large factory loom, but his radical change in loom construction opened up entirely new possibilities in connection with the system of twisting.

"Davisson, in the first patent in suit, not only revolutionized the organization of the machinery in the manner I have referred to, but he also produced a machine capable of producing a distinctly novel and meritorious fence fabric in addition to the old fabric which I have spoken of as the simple net fencing. The new fabric which his machine was capable of making has warp wires running through all the intersections of the diamonds, the wires of the diamonds at their intersections being intertwined with each other and around these warp wires.

"Fig. 3 illustrates this new fabric. Take out the intermediate warp wires and it would be simple net fencing having all the defects which I have pointed out in connection with Fig. 1. Notice the advantages of the new fabric as a fence. The stability of the fence is no longer founded exclusively upon the top wire, for that wire and wires below it can be broken or removed without interfering a particle with the stability of the

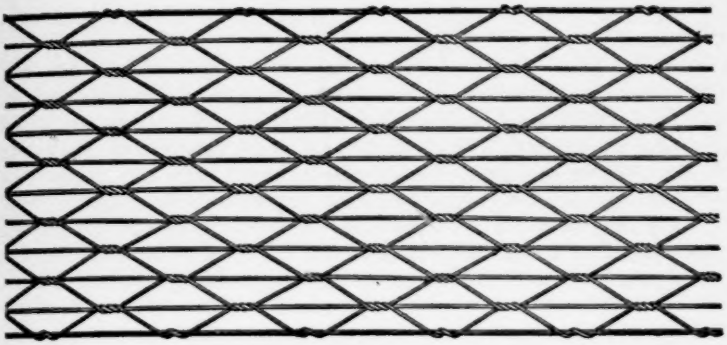


Fig. 3.

fence, but only with its height. Again, all of the diamond work might become broken or removed and a fair sort of a fence would remain. Again, each of the diagonals formed by the woof wires runs practically continuous diagonally from the top to the bottom of the fence, there being no break joints. Again, every single short wire element in the system aids in reinforcing and bracing all its neighbors. Any single short element in the fence may be cut without affecting the general strength of the fabric, the break or cut having only the effect of producing a local hole in the fence. Again, this fabric, being so firmly bonded in all its units, has very superior vertical stiffness, and, as a whole, takes on a board-like characteristic of structure quite lacking in the simple net fencing.

"Thus far it has been assumed that fence fabric, whether simple net fencing, or Sedgwick twin netting, or the improved fabric, call it Kitselman fencing, has been made in the factory on expensive, bulky, complicated power looms and rolled up and sold to the farmer to be stretched in the field and attached to posts. As thus viewed, the fabric were merely fencing material.

"But the farmer has little money and often plenty of spare time, and it would be obviously advantageous if the farmer could have his own loom, but such looms are too costly and complicated for the farmer, and they require driving power and skilled operation. If a loom could be cheap and operated by hand, and have not more complications than an apple-parer, it would be useful. And if, in addition, the loom could be taken right out into the field to the fence line and there weave its fabric *in situ*, the advantages would be still more apparent.

The product of such a field loom would not be material for a fence, but would be the fence itself.

"The idea of the simple field loom is quite an old one, and many have been used, but they were quite incapable of weav- the fabric in question or any analogous fabric. They did not do all the work, and they were only capable of producing picket fences, formed of wooden pickets placed in position by hand and then bonded by twisted strands of wire, the twisting of these wires, after the pickets were placed by hand, being the sole duty of the machine which I have called the field loom, a machine hardly entitled to that designation because it did not weave anything or of itself produce a fabric. But it is of importance at this time to understand these old machines, for they involve a simple wire twisting operation which, being understood, will help in the understanding of the more complicated operation involved in the weaving of netting.

"As a good example of such machines, I refer to Middaugh & Wilcox's patent, No. 309,724, calling particular attention to Fig. 2 of the drawing, which shows the machine at work in the field on the line of fence. B indicates a vertical frame standing on a foot roller so it can travel along the fence line. H indicates a vertical series of rotary cylinders having cog wheels so that by turning the hand crank D all will revolve together. On the front end of each of these cylinders (see Fig. 7) is a cross-bar, K, having a pair of holes, L. Fig. 7 shows additional holes which may be ignored, being for alternative use. Two wires, together, are fastened to a fence post and led to a twisting cylinder, each wire of the pair going through a hole, L, in the twister, the pair of wires then being carried onward to the rear of the twister and fastened under tension. A pair of wires is similarly strung through each of the twisters, Fig. 2 showing a fence having four strands of wire. A picket is now placed vertically between the wires of all the pairs, the twisting machine being pushed up on the wires close to the picket. The twisters are now given two or three turns, thus twisting the wires of the pairs and confining the picket. At the time this twisting took place, the desired twisting, the wires at the rear of the twister also became twisted and entangled. Here is an illustration of that rear twisting which was so fatal in netting looms and required machinery to take care of it, before the invention of Davisson. But in these picket fence machines this rear twisting was harmless. As the operation has been thus far described, we have a picket in place and the retaining twists formed just in advance of it, and an entangling twist formed at the rear of the twisting machine. The machine is now

moved somewhat away from the picket and a new picket inserted and the machine pushed up against the picket ready for the new twists. If an attempt were made to make this new twist in the same direction as the old twist, then the entangling twist at the rear would be troublesome and would become fatal to continued operation of the machine. But this difficulty is all overcome by the simple expedient of making the new twist in the opposite direction, which results in untwisting the rear entangling twists and producing a new rear entangling twist of reverse direction. Thus each operation produces useful twists at the picket and produces a rear entangling twist, the alternate twists being in opposite directions so that the rear entangling twist is first produced and then undone. Between Figs. 5 and 6 of the drawing there is seen a picture of three pickets with the retaining wire twists. It is to be observed that the successive twists are in opposite directions. There is no objection to this in such type of fence. The type of fence is objectionable in that it contains wooden pickets cut into by the embracing wires and forming, above each wire, pockets which retain moisture and produce rotting of the pickets. Again, the wires tightly embrace the pickets and cut partially into them, and each swaying of the fence, continually occurring, causes a rubbing and cutting of the embracing wires upon the pickets, resulting in weakening them and in their ultimate destruction. The falling out of a picket slackens the entire panel of fencing. Futhermore, the fencing is expensive in cost and maintenance. Mr. Wiles, in referring to portable fence machines of this class, appears to have failed to appreciate the high advantages due to portable field type of machines, or to appreciate the disadvantages of the only fabric they were capable of making.

"Davisson, in the first patent in suit, greatly simplified and improved factory machines or fixed looms for making wire netting and he produced the first machine capable of producing the highly meritorious Kitselman fabric. Kitselman, in the second patent in suit, modified and adapted and rearranged the twisting system of Davisson so that for the first time in the art it became possible to build a fence *in situ* of wire netting form and of the improved Kitselman form. In the absence of the Davisson invention, this could never have been accomplished in the absence of substitutive original invention or, in other words, in the substitutive origination of the Davisson system. And it could not have been accomplished in the absence of the invention superposed by Kitselman upon the Davisson system. Mr.

Wiles appears to have entirely overlooked these important aspects of the case.

"Conner and Pope, in the later patents in suit, still further modified and improved the Davisson-Kitselman system in the direction of increased capacity, certainty of operation, uniformity of product, and simplicity and substantiability of machine, the ultimate result of the chain of inventions being a very admirable field loom of low cost, great simplicity, highly efficient operation, capable of perfectly making the new fencing, and capable of yielding perfect product when operated by the unskilled labor of the farmer.

"In connection with the picket fence machines I have explained that as the desired twisting took place a rear entangling twisting simultaneously occurred but that this rear entangling twisting became untwisted at the subsequent operation. In connection with netting looms I have stated that this rear entangling system was fatal if it occurred, or, in other words, that twist-preventing mechanism was necessarily provided in the old looms to guard against such rear twists taking place. But I may not have been clear enough in explaining why these rear twists were permissible in one case and absolutely non-permissible in another case. In the picket fence machines, the two wires of a pair are continually associated with each other, and with each other only. Those two wires go through their own twister and stay there. But, in the netting machines, of all kinds, a given pair of wires is twisted together and then each wire of that pair is removed from their twister and deflected sidewise into a neighboring twister and put into association with a new wire with which it is to be twisted. Therefore no mere reversal of twists will take care of the rear entanglements, for, before a new twist takes place, the rear wires concerned in that twist must not be entangled with wires with which they were previously associated.

"In the old netting looms the twists were produced by twisting wheels provided with means for transferring the wires from twister to twister after each operation; the wires proceeded through the twisters rearwardly to their reels; in the absence of rear twist-preventing mechanism the rear wires would become fatally entangled at each twisting operation, or stated otherwise, there could not be a second twisting operation; special machinery was therefore provided to give orbital motion to the reels to prevent the fatal rear twists while the twisters

were producing the functional twists desired; such construction doubled the machines in function, necessitating a mechanism to do the twisting and a mechanism to feed the wires in such manner as to prevent the rear twisting; the machines were thus essentially bulky, complicated and expensive; the machines could not produce the improved Kitselman fencing.

"Davisson, in the first patent in suit, abandoned the troublesome rear portion of netting looms and mounted his reels right at the twisting point, causing them themselves to perform the twisting operation. He, for the first time in the art, placed his reels for the woof wire in this new position. The exigencies of the netting weave required the transfer of wires as they had been before transferred, but in his case he was confronted with the peculiar conditions of woof reels disposed right in the twisting zone, the transfer of the woof wires after each twist thus requiring the bodily transfer of the reels themselves. He accomplished this by providing his twisting spindles with cross-heads or cross members bearing the woof reels as forwardly projecting members and arranged to transfer his reels from the cross-head of one spindle transversely to the cross-heads of neighboring spindles. In order to bring the cross-heads into line so that the transverse transfer might be effected, he moved his spindles and cross-heads and woof reels endwise after each twist. This was quite permissible in a fixed factory loom, but was not permissible in the compact structure requisite in a field machine. He made his twisting spindles hollow so that all of the inter-twists of the diamonds could take place around intermediate warp wires whereby all of the units of the fabric became bonded together.

"Kitselman, in the second patent in suit, recognizes the radical merit of the Davisson system of weaving wire netting, and recognizes the apparent inconsistency of that system with any idea of realizing that system in a portable field machine without the exercise of original invention. He adopts the frontal reel and twisting system of Davisson; he adopts Davisson's hollow spindles and cross-heads and shifting reels. But he abandons Davisson's longitudinaly moving spindles and cross-heads and reels and arranges for effecting the transfers by transverse movements only, thus realizing the Davisson system of weaving in a structure whose complexity and bulk were within the limits imposed by field loom conditions. He realized and pointed out the capacity of the improved machine for producing in the field, not only the old simple wire netting of previous loom construction, but also the highly improved Kitselman fencing. In his machine the transfers after each twist-

ing were effected by the manipulation of a special hand lever.

"Conner, in the third patent in suit, dealing with a fixed factory loom, adopts the frontal twisting system of Davisson, along with his hollow spindles and cross-heads; and he adopts the transverse transfer system of Kitselman, thus avoiding the longitudinal motions of Davisson. To this combined Davisson-Kitselman system he adds an automatic transfer system whereby, instead of having to operate a hand lever after each twist, as in Kitselman, the proper transfers are effected automatically. While his machine was a fixed loom, it was of exceedingly compact and simple form, well lending itself, by mere omission mainly, to adaptation as a field machine, though his patent does not mention this matter. But his patent does well disclose the application of the automatic transfer system to a machine founded on the Davisson-Kitselman system of twisting machinery.

"Kitselman and Conner retained the rotary spindles of Davisson with the warp wires passing through their hollow centers. Such spindles, being rotary, require more or less careful workmanship and mounting, and, being rotary, their outer active ends are liable to move in orbits if the spindles are not accurately made or mounted firmly in their bearings of rotation. Furthermore, such spindles, turning on the warp wires which pass through them, may tend to rub and chafe those wires under the strain produced by the twisting operations, a matter worthy of some consideration in connection with the thinly coated galvanized wires usually employed for fencing. Pope, in the fourth patent in suit, adopts the frontal twisting system and hollow spindles and cross-heads and general transfer system of Davisson; he adopts the exclusively transverse transfer system of Kitselman; he adopts Kitselman's scheme of bringing the forward end of the spindles well forward in the zone of twisting, Kitselman having improved over Davisson in that respect; but Pope mounts the spindles stationary so that they have no motion whatever, the spindles thus furnishing fixed supports for twister mechanism and permitting of the frontal twister system of Davisson being realized in an outreaching system of reel support founded on a single bearing at the rear. The spindles, being non-rotary, also avoid any damaging turning upon the wires which pass through them. This construction simplified and cheapened the machine and improved its stability, improved the accessibility of the woof reels, and improved the general facilities for setting and operating the machine."

This preliminary outline of the prior art is followed by a specific exposition of the distinction between the several patents in suit and each of the prior patents introduced by defendants. To this particular reference is made hereafter.

Davisson Invention.

Defendants' expert, when asked in cross-examination to name the nearest approach in the prior art to the inventions of the Davisson and Kitselman patents here in controversy, names the Nesmith patent of 1854, having to admit, however, that he has never seen any machine purporting to be built under that patent or corresponding to the construction of it. (*Dep. Wiles, R., p.* 172, *A.* 14; *p.* 174, *A.* 21.) It is significant that the only portion of that patent which he undertakes to illustrate in evidence by a model is a part concerned solely in performing an office that is entirely dispensed with by the inventions of the Davisson and Kitselman patents, and that the features of this model upon which he relies are not shown or described in the Nesmith patent, but are evidently contrived by him in light of complainant's patents, without any warrant from the patent after which he names his model. The portion of the machine to which his model purports to correspond is, according to the Nesmith patent, machinery necessarily used to counteract or take care of the "rear twist" which was incident to twisting mesh by the means provided for that purpose in the Nesmith patent and in the other loom machines preceding Davisson, this corrective machinery alone being more bulky and cumbersome, and consuming more power than the entire Kitselman machine. This Nesmith patent, like other loom patents of the prior art, twisted the wire into mesh by means of radially slotted gears through which the wire was stretched from reels located and carried by mechanism in the rear of such slotted gears (that is to say, on the opposite side of the slotted gear from that on which the mesh was formed). The effect of twisting the wire into the mesh by this means was to form a corresponding reverse twist in the wire behind the gears, and such rear twist would necessarily stop the operation of the machine unless some corrective or counteracting agencies were provided. The twisters of the Nesmith patent are slotted gears marked J J (*R. p.* 414). All the machinery behind those twisters J J (that is to say, all between them and the bottom of the page in the illustration on page 579, and some machinery not shown in that illustration) is occupied in correcting or counteracting this rear twist. This mechanism does not twist the wire into mesh, but untwists the wire in the rear of the actual twisters as fast as the latter tend to twist

it, thus enabling it to be fed to the twisters in an untangled condition. In the Sedgwick patents, which shortly precede the Davisson, and which are referred to by defendants' expert as among the nearest approaches in the prior art, the corrective mechanism for dealing with this rear twist is quite as complicated and bulky as in the Nesmith patent. It was an indispensable constituent of all machines weaving the wire by the means depended on in these prior patents, and both by reason of the numerous elements inseparable from this method of twisting the mesh and the bulk, weight and mechanical complications required, and by reason of the stability and the power necessary to practical operation, excluded their adaptation to any field use. It also added greatly to the cost of constructing and operating the machine for stationary use, if it did not altogether disqualify it for any practical service. This has been very fully explained by Mr. See, under the title of "Wire Looms." (*R., pp.* 189 195; *pp.* 206-210; *pp.* 212-218); also by Mr. Dayton (*pp.* 272-283). I make reference to their testimony instead of repeating it here.

The Davisson invention embraced in the two claims here in suit (2d and 3d) abolished all this complicated mechanism and all the power required to operate it, while increasing, instead of lessening, the capacity of the machine. Instead of passing the wires through slotted twisting gears and providing the complemental mechanism for removing the fatal rear twist which resulted from the operation of those twisters in forming the meshes of the fabric, Davisson projected forward from the revolving gear wheel spindles provided with a cross-head at their working ends (that is, the ends in advance of the gear which rotated them), adapted to alternately receive and discharge the spool or bobbin carriers on which the woof wires (the wires to be twisted in forming the mesh) were coiled. He mounted the spool carriers on this cross-head, on each side of the hollow spindles in front of the gear which gave rotation to such cross-head, in such manner as to make these spool carriers and the cross-head on which they were mounted the twisting agent by which wire carried by the spool on one side of the spindle was twisted around the wire carried by the spool on the other side of the spindle. These spools or bobbins being thus placed on the *fighting line* (as Mr. See has expressed it), were, with the cross-heads, made the direct agents for imparting the desired twist to the wire, and it was thus made unnecessary to extend the wire through slotted gear and slide it from the slot in one gear to the slot in adjacent gear, with the resulting back twist. The rear twist, which was inevitable in the prior machines, was thus completely excluded and the simple expedient of substituting the spindle projecting forward from the gear which revolved it, carrying the cross-head with the shiftable spools thereon, superseded all the intricate machinery by which Nesmith, Sedgwick

and other prior inventors had endeavored to counteract or untangle the rear twist so fatal to the operation of their machine unless it was taken out as fast as the weaving twist was applied.

The Davisson invention provided for shifting the spool carriers to adjacent spindles and cross-heads after the requisite twist had been applied, so that these spools revolved about a new center at each successive twist, the movement being such that the wires carried by the respective spools were thereby crossed immediately in front of the spools at each transfer. Each of these spindles being made hollow, enabled warp wires (or longitudinal wires) to be extended through the several spindles midway between the spools on the opposite sides of the spindles, so as to occupy the central line where the wire carried by the spool on the one side of the spindle was intertwisted with the wire carried by the spool on the other side of the spindle, the rotation of the cross-head thus winding the opposite wires around this longitudinal wire at the same time and at the same point that the opposite wires were intertwisted with each other, forming a fence exceptionally stable and efficient against all strains and accidents to which it is exposed. These longitudinal wires extending through the center of the meshes thus formed require no twist to properly incorporate them into the fence, since the twist of the opposite wires about them applies the necessary grip. Hence, there is no rear entanglement encountered with them.

The second and third claims of the Davisson patent cover in terms the invention thus far described, which is equally present in complainants' and defendants' machines.

These claims are as follows :

> " 2. In a machine for making wire fabric, a series of spindles arranged in a line and mounted in bearings on a suitable supporting-frame, and having on each spindle a cross-head carrying reels for wire on opposite sides of the axis of said spindle, substantially as specified.
>
> " 3. In a machine for making wire fabric, two or more hollow spindles adapted to admit the passage through their axes of wires forming the edges of the fabric, and having on each spindle a cross-head carrying reels for wire on opposite sides of the axis of said spindle, substantially as specified."

Kitselman Invention.

While the Davisson invention enabled the weave or mesh to be performed by means exceedingly simple, compact and economical as compared with anything exhibited in the prior art, and removed one

of the conditions which excluded field use, the machine was in other respects constructed upon a plan incompatible with such use, and it remained for Kitselman to conceive and embody a machine capable of weaving the wire mesh in permanent position, preserving in the fence the initial tension applied in weaving. Utilizing the hollow spindle on the projection forward of the rotating gear, with its cross-head and transferable spool carriers thereon, as the direct agents by which the twist is imparted to the intermeshing wire and by which the machine is also enabled to imbed the longitudinal or warp wires along the central line between the opposing cross-heads, Kistelman contrived a machine in other respects essentially original. The very conception of the possibility and practicability of creating a machine adapted to weaving wire mesh fence *in situ* seems to have been original with him. It necessarily involved a distinctly original plan of construction. The spindles of the Davisson machine were arranged vertically and had in the operation of the machine a longitudinal movement which required driving mechanism of a kind inconsistent with field use. The structure of the machine generally was neither suggestive of nor compatible with weaving a fence in the position which it was to occupy, or weaving any fabric along a line of permanent attachment. It was a loom adapted and intended for stationary factory use in the manufacture of wire fabric as an article of commerce. Kitselman, after stating in his patent that his invention "relates to machines for making twisted wire fabric for use as fencing and analogous purposes," added :

> "The primary object I have in view in my invention is to provide a simple and easily operated machine of the class named which can be adapted for use in the open field or other place for the construction of fences, as well as a stationary or fixed machine for the manufacture of wire fabric.
>
> "A further object of my invention is to provide a machine of the class specified which can be adapted for the manufacture of different classes or designs of wire fabric and fences, when used as either a portable or stationary apparatus, without requiring any adjustment or interchange of its parts."

The qualification for field use, *in addition to* that for shop use, and the capacity to make the wire mesh fence for which it is peculiarly adapted, with the incidental advantage that it could also be used for making other varieties of fence, are made conspicuous in the patent.

Instead of the vertical, longitudinal, reciprocated spindles of the Davisson patent, Kitselman provided a series of short horizontal spindles arranged in vertical line, and stationary so far as any longi-

tudinal or lateral movement was concerned, so that the cross-heads would be kept permanently in the plane of their rotation instead of being thrust into and withdrawn from that plane beween the successive twists. He formed the twisters in three sections, all extending forward from the cross-head and mutually supporting each other concentrically in the line of strain incident to the twisting operation, or, as Mr. See expresses it, in "the twisting zone" or the "plane of aggression." The central section was fixed in permanent alignment, while each of the side sections were adapted to be supported by the central section when rotating upon it as a center, the three sections forming, during the period of this rotation, a substantially solid twister, severally supporting the three wires in the plane of the twisting action, and, by contact of the faces of the three sections in this plane, offsetting the counter strain incident to this twist. The side sections, when in the arc of rotation which brought them into proper registration, were adapted to slide from the central sections with which they had been in conjunction to the central sections next above and below, the shifting sections on one side of each central section, moving to the central section above, while the shifting section on the other side moved to the central section below, the several shifting sections entering into the same relationship with the central section to which they were thus transferred as they had before maintained with the central section from which they departed, the entire movement taking place without any endwise movement of either section and through guides brought into registration with both central and shifting sections when in this arc of rotation.

The three sections, composing for the time a practically solid integral twister, were maintained in parallelism by so forming them that the sections were in engagement, or impinging contact with each other on the transverse diametrical line taken through the points at which the intertwisting wires exert their stress during the twisting operation, the sections being adapted by their impinging surfaces to engage with each other and mutually support each other against concentric strains, both before and behind the spools. The tendency of the spool carriers to be rocked inward by the concentric pull of the wire on their front ends was thus excluded.

The central sections of the twisters were geared directly with each other in such manner that the rotation of one gear communicated uniform rotation to the series of sectional twisters, alternate twisters rotating in opposite directions, enabling the operator to apply any desired number of twists, and superseding the rack system of actuating the spindles incident to the Davisson construction which was not consistent with the economy of power and space demanded in a field machine. The entire mechanism was so contrived and combined as to bring it within very narrow compass, and reduce it

to great simplicity of structure, at the same time economizing the power required for its operation. It was compactly mounted in a narrow vertical frame, which carried the twisters on horizontal axes in vertical alignment. This frame was provided on one end with trucks or rollers, and provided also with means for advancing it along the ground in the direction of the axes of the twisters by an intermittent motion corresponding to the spacing of the mesh. The sectional construction of the twister, by bringing the central tube in supporting contact with the side sections on the diametrical line taken through the wire supporting openings in the head of each section, neutralized the converging strain upon the reel-carrying sections. The central section being interposed between the two outside sections in the line where the convergent pull incident to the twisting operation is encountered, transmits directly through that line the opposing forces applied upon the opposite sections, these forces acting always in opposite directions on the line taken through the wire-supporting openings in the front of the three sections. These opposing forces being approximately equal, offset each other in the plane in which the strain comes, and the spool carriers are relieved from the converging leverage on the cross-heads which would otherwise result. The elimination of this strain, effected by the sectional construction of the twisters, simplifies the attachment of the spool carriers to the cross-head, dispenses with the occasion for making them as massive as would otherwise be required, and avoids the tendency to twist the opposing reels or reel carriers out of parallelism, which, in the absence of the sectional construction, would be mischevious, and might be runious if not resisted by a more ponderous construction than would be consistent with convenient field use. It also prevents deflection of the central wire in the plane of twist, and maintains the two woof wires at uniform distance from the center. The plan of construction thus introduced by Kitselman made a thoroughly practical and highly useful field machine for weaving wire fence, and that plan has been closely adhered to in every subsequent machine for this purpose.

The claims in controversy embrace broadly this machine with its series of sectional twisters, each comprising a central section for carrying a warp wire and having rotary movement imparted thereto, and the shifting sections for carrying the weft wire and receiving rotary motion from a central section to form the twist, substantially as and for the purposes described, some of the claims in controversy specifying additional elements in combination with those here mentioned. The claims in suit are as follows:

"1. In a wire fabric machine, a series of sectional twisters, each of which comprises a central section for carrying a

warp-wire, and having rotary movement imparted thereto, and the shifting sections for carrying the weft-wire, and receiving rotary motion from the central section to form the twist, substantially as and for the purpose herein described.

"2. In a wire fabric machine, the combination of a series of sectional twisters geared together for simultaneous rotation, and each comprising a central portion movable only on its axis and side portions capable of a compound movement—that of rotation on their axes—and of a shifting longitudinal movement, substantially as described, for the purpose set forth.

"9. In a wire fabric machine, the series of sectional twisters, comprising the central and side sections, the central section of each twister being geared to the twister adjacent thereto for simultaneous operation, substantially as described, for the purpose set forth.

"10. In a wire fabric machine, the combination of a series of twisters geared directly together for simultaneous operation, and each comprising a central section and the side sections, each side section carrying a spool or reel for the wire, substantially as described, for the purpose set forth.

"11. In a wire fabric machine, a series of twisters connected for simultaneous operation, and each consisting of a central section and the side section, in combination with the spools carried by the side sections, the central section of each twister being provided with a longitudinal opening for the passage therethrough of the warp wire, substantially as described.

"15. In a wire fabric machine, the combination of a series of rotary twisters geared directly together for simultaneous operation, each twister having a central section capable of rotary movement only, and two side sections which are capable of a shifting movement independently of the central section in opposite directions simultaneously, whereby the said shifting sections of one twister are adjusted to register with the central sections of twisters on opposite side of the same, substantially as described, for the purpose set forth.

"20. In a wire fabric machine, a series of sectional twisters, each comprising a central section, the central sections being geared together to be simultaneously rotated on their axes, and the shifting side sections adapted to align with the central sections to be rotated therewith, substantially as described, for the purpose set forth."

Concerning this Kitselman invention and several claims in suit, Mr. See says (*R. p.* 219):

"The old field machines made only picket fences. In connection with any thought of netting fences made *in situ* the whole fraternity of these old picket machines were only suggestive of something earnestly to be hoped for, but apparently incapable of realization. The old netting machines with their front and rear complexities, complexities in severalty and in common, were probibitive as field machines. Davisson revolutionized netting machines, dispensing with the old rear portion and employing a front portion of great simplicity, as far as the twisting was concerned, but providing for the transfer of woof reels only by means of longitudinal retiring and advancing motions for the twisting spindles, a system of transfer involving bulk and workmanship and cost quite inconsistent with field machines. Kitselman adopts the Davisson system of twisting and transverse transfer of woof reels, but, by the super-position of original invention effects the transfer by transverse motion only, thus at once bringing netting machines into condition available as field machines of compactness, cheapness, efficiency and lightness of operation. He extended the hollow spindles of Davisson clear forward into the twisting zone and provided them with cross-heads at their fronts and rears. He placed his woof reels in reel carriers arranged for transverse motion on these cross-heads so as to be capable of turning with the spindles and of being transferred from spindle to spindle as in Davisson, the transfer, however, being effected by transverse motion only. In the Davisson construction, as exemplified in the Davisson patent, the reels, or their cases, were the twisters, the spindle forming the rotator standing well back of the reels and well back from the twisting zone, a given spindle with two reels therefore presenting the aspect of a two-part twister rotated by the hollow spindle through which passed the warp wire going unsupported forward to the twisting zone. Kitselman, by extending the hollow spindle forward clear to the twisting zone, gave the warp wire support against the side strains of the woof wires right in the zone of twisting, the spindle thus becoming a supporting agent in the twisting and the entire twister, formed of the reels with their cases and the spindle, forming a three-part twister. By stopping the cross-heads when in line he could shift the reel carriers to other spindles, as in Davisson, except that no longitudinal motion of the spindles was necessary. At each side of the rank of twisters he arranged switchboards having notches engaging the reel carriers, and by

properly reciprocating these switchboards he could shift the reels from spindle to spindle as desired. He arranged a special hand lever for operating these switchboards. He placed the spindles far enough apart to permit the orbital motion of the woof reels without interference, and then, at the rear of the twisters, he provided the spindles with directly intermembering simple gears, by means of which all the twisters could be turned in unison through the medium of a hand crank. Adequate provision was made for moving the very compact little machine along the line of fence as the weaving progressed, it being understood that in previous netting machines the machines were always fixed factory machines in which the fabric was the portable element and advanced through the machine. The result of Kitselman's invention was that netting machines became as available for field use as picket machines had previously been. And Kitselman first exhibited, in his patent, the Kitselman fencing with warp wires running through all of the diamond intersections of the netting and having the woof wires intertwisted with each other around these warp wires, yielding an integral fabric of peculiar strength and stiffness, with all its units co-operating in giving the fence its superior strength.

"Without the invention superposed by Kitselman upon the Davisson system a field machine for weaving netting *in situ* does not appear to have been possible; and without the Davisson fundamental system of netting machines it does not appear that field machines for weaving netting would have been possible.

"Kitselman illustrates and described his machine as a field machine, but, apparently recognizing its peculiar compactness and simplicity and adaptation to hand operation, he suggests the use of the machine indoors by supporting it horizontally on legs. It is with the aspect of his machine as regards the compactness and simplicity adapting it to portable or field use that we are at present concerned.

"The Kitselman specification states, just preceding the claims:

"'I do not wish to be understood as confining myself to the exact details of construction and form and proportion of parts herein shown and described as an embodiment of my invention, and I am aware that numerous changes therein can be made without departing from the spirit or sacrificing the advantages of my invention.'

"I understand from this that the specific construction shown and described is to be considered as a mere exemplification of

the invention, and subject to modification in details not inconsistent with the invention.

. . . . . .

"Regarding the first claim: I understand this claim to refer to the Davisson twister system, which is, as I have before stated, a two-part system or two-section system with a hollow rotator for each twister, the improvement referred to in the claim being the provision of a central twister section carried forward into the zone of twisting or into the plane of action of the aggressive twisting agents of the woof reels. In Davisson the reels were in reel carriers of disk form of cases, the woof wires passing out to the field of twisting through frontal eyes in the reel carriers, these eyes forming the aggressive twisting agents for the woof wires. Kitselman has the same eyes in the same plane and acting in the same manner to form a two-section twister, but he carries his central section forward into this same plane and causes it to carry the warp wire and give it support in the same plane, the warp wire, or border wire, as the case may be, being thus supported in the plane of aggression of the twisting eyes of the side sections so as to resist the side strain imposed by the transverse pull of the woof wires. The office of this central section, in merely carrying the warp wire, is in no wise dependent upon any rotation of any part of the system, rotation being an attribute of the side section which carry the woof reels in their twisting orbits. This functional two-section twister must have the rotary movement and the shifting movement of Davisson and the central section must carry the warp wire, and the shifting side sections must receive their rotary motion from the central rotary motion of the twisting mechanism, the central section of the twisting mechanism having a fixed position to carry the warp wire and give rotary motion to such of the side sections as may be brought into association with it from the other twisters.

"The improvement referred to in this claim would obviously better the Davisson machine, regardless of any modification of the driving system or shifting system.

"Regarding the second claim: I understand this claim to refer to the same matter when the shifting is accomplished without longitudinal movement of the central portion of the twister or, in other words, by the simple transverse movement of the side sections, thus radically improving the Davisson system as regards the manner of shifting and adapting the Davisson system to a compact embodiment consistent with a portable machine. I have spoken of the shifting of the side sections very frequently as being 'transverse.' The claim uses the term 'longitudinal.'

Both terms mean the same thing when analyzed, the shifting motion of the side sections being transverse to the axis of the twister, and longitudinal to the entire series of twisters.

"Regarding claim 9: I understand this claim to refer to the same matter when the central sections of the series are disposed such distance apart as will permit the turning of the woof reels without interference between contiguous twisters, the central rotating section of each twister being provided with a spur gear of sufficient diameter to engage the gears of the adjacent twisters whereby a simple train of gear gives simultaneous motion to all the twisters. Davisson had a smiple gear on each spindle, but these gears did not engage each other, all being engaged by a common reciprocating rack. The simple intergaging train of gears was well known in the old field machines for making picket fences, but those machines had no reels or shifting sections whatever to deal with. In the Davisson system of driving the twisters, the number of permissable twists was limited by the permissable stroke of the driving rack, while in the intergeared system there is no limitation, it being possible to shift side sections from one set of spindles to another, and then, when in their new position, give them any desired number of orbital turns.

"Regarding claim 10: This claim appears to refer to substantially the same matter, but mentions specifically the woof reels as being carried by the side sections. This claim requires that the twisters as twisters, shall be geared directly together, but does not, like the ninth claim, require that the gears be on the central sections of the twisters, the tenth claim probably contemplating any system of direct intergears which gives rotary motion to the essential rotary portion of the twisters.

"Regarding the fifteenth claim: This claim would appear to refer to the same matter as the tenth claim when the shifting of the side sections is accomplished without longitudinal motion of the central sections, and to also involve the bringing of the cross-heads of the central sections into line, or into registering position to permit of transferring the woof reels, by the rotary motion given simultaneously to all of the central portions, and by that motion only, or, in other words, the rotary motion of the parts serves not only in producing all of the functional twisting motion, but also in producing all of the conditions necessary to permit of the shifting of the side sections being effected. This claim also involves the intergearing of the twisters.

"Regarding the twentieth claim: This claim refers to the same subject-matter as the fifteenth claim, but requires that the

intergearing of the twisters shall be accomplished by intergearing their central sections.

"The terms 'align' and 'register,' as used in some of the claims, mean the bringing of two twisters in such relative angular position as is consistent with the initiation of the transfer of woof reels from one twister to another. In Davisson this registering or receptive condition is brought about by a compound movement of the spindles, an angular adjustment and a longitudinal adjustment being requisite, while in Kitselman an angular motion only is needed, this motion being produced by the same simple mechanism which is employed in producing the twist."

See, also dep. Dayton (*R.*, *pp.* 36-44).

Conner Invention.

In the Kitselman patent, whenever the rotating three-section twisters reached the arc of revolution where the several sections were in proper registration with those above and below, the outer section on one side of each twister could, by turning a separate hand-lever from that which rotated them, be caused to move away from the central section, with which it had been associated into similar relation with the central section above it, while the outer section on the other side was at the same time, and by the same movement of the hand-lever, caused to move into similar relationship with the central section below. This divorcement of the outer sections from the central section, with which they had constituted a composite twister, and incorporation of them into the same composite relationship with adjacent central sections, could readily be effected by the same operator who was turning the crank to rotate the twisters, but it involved the use of a separate lever or crank from that used to rotate the twisters. The Conner invention here in controversy consists in combining, with the shiftable spool-carriers and intermeshing gear, what he terms "automatic switches," by which, when the spool-carriers are brought into proper registration with those above and below them, the movement of the crank by which the twisters are rotated causes the divorcement of the spool-carriers from the central sections with which they have been associated and their transition into a similar relationship to the adjacent sections, the purpose and effect being the same as in the Kitselman patent, but being accomplished through the same crank that rotates the twisters, without requiring the manipulation of a separate lever. The claims in controversy are as follows :

"2. The combination, with a train of intermeshing gears arranged in line, each gear having a hollow shaft, of notched spool-carrier disks mounted on said hollow shafts, bobbin-frames mounted in said notched disks, and automatic switches by which the bobbin-frames are simultaeously withdrawn from the notches of those disks having similar rotation and lodged in the notches of the adjacent oppositely-revolving disks, substantially as described.

"3. The combination, with a train of intermeshing gears of equal diameter, mounted on prolonged hollow shafts arranged in line, of a corresponding series of spool-carriers mounted on said hollow shafts and having notched disks, bobbin-frames having journals lying in notches of said disks, and switches by which the bobbin-frames are each withdrawn from the notches in one pair of disks and lodged in the notches of the adjacent oppositely-revolving pair of disks substantially as described."

Mr. Dayton explains more fully the nature of this invention and the mode of operation as follows (*R.*, *p.* 44):

"Next, taking up the Conner patent in suit, I first point out that this patent shows a machine arranged as a loom for stationary or factory purposes. It has the series of hollow spindles arranged in line with each other, as in the Kitselman and Davisson machines of prior date, but it has these spindles arranged in a horizontal plane, instead of in a vertical one and directed upwardly, as in the Davisson. The invention of the Conner patent relates primarily to the mechanical handling of the shifting spool-carriers accompanying the spindles, in the operation of the machine. All the capabilities as to variety in the width and weave of the product set forth by Conner are the same as those of the Davission patent and are due to the same reason, to wit, the employment of a series or multiplicity of hollow spindles arranged in the same plane, combined with shiftable mesh-wire spools, which in the operation of the machine are transferred from one twister to another and back again, to make the successive meshes. The gear wheels of the twisters are meshed directly with each other, as in the Kitselman patent, so that the machine is capable of being driven by a continuous rotary motion. The spool-carriers applied to either of the twisters and forming what Kitselman calls the 'side sections' or the 'shifting sections' of the twisters, are flush, practically, with the ends of the hollow spindles, so that the machine has this feature also of the Kitsel-

man invention. What Conner did of importance was to introduce automatic means for shifting the side or shifting sections of the twisters from one twister to another, at proper intervals. This he does by means of what he terms 'switches.' In the first place, he supports the side sections or spool-carrying frames of the twisters at a suitable distance from the hollow spindle by means of disks attached to the spindle, said disks being located one at each end of the spindle and being provided each with marginal notches in which may rest projections or bearings on the spool-carrier frame. The spool-carrying frames are held in these notches during the revolution of the twisters by outside bearings confining them there, portions of said outside bearings being movable and adapted to change the course of a spool-frame from a path around one of the spindles to a path around the next adjacent spindle. That is to say, when the spools are brought into line with each other and with the spindle, the spool-carrier frames rest in both the notches of the disks belonging to adjacent twisters, and, according to the position of the movable part of the confining surface referred to, said spool-carrier frame will proceed from this point in the notches of the disk by which it was brought to this point, or it may be made to leave this point in the notches of the adjacent disks, and thus travel around the spindle of the adjacent twister. As the patent puts it (page 2, line 84), 'This gives to each spool-carrier a travel in the path of a figure 8, the arjacent disks crossing each other's path at each revolution, and thereby forming the net or loop in the wire, and afterwards producing a twist at such point, having as many turns as the spools make distinct revolutions after the wires cross.'

" The introduction of automatic 'switches,' so-called, enables the machine to be operated exclusively by means of the driving power which rotates the switch. In other words, the automatic switches dispense with hand-operated means for shifting the side sections of the twisters from one twister to another and back again. The operator has, therefore, only to manipulate his driving crank to accomplish the whole work. of twisting and of shifting the shiftable sections of the twisters. Of course, in the field machine he has still to perform the work of moving the machine along over the ground at the proper interval.

" What are called 'bobbin-frames' in these claims are what I have called spool-carriers, spool-frames or reel-frames heretofore. The 'intermeshing gears' are the immediate driving gears of the twisters. The term 'spool-carriers' is differently used in these claims and in the specifications and differs from the use I have made of it, said term being applied in said claims to the

supports on the spindles by which the 'bobbin-frames' (heretofore denominated spool-carriers or spool-frames by me and sometimes called 'spool-carriers' in the Conner specification) are held out at a proper distance from the spindle and, as to their forward, ends, supported against the inward strain or pull of the mesh wires in the twisting operation, that is to say, what are called 'spool-carriers' in the claims are said to be mounted on said hollow shaft and to have notched disks, already explained as forming the support of what I have called the spool-carriers or spool-frames and what the claims of this patent term the 'bobbin-frame.' "

Concerning the same patent, Mr. See says (*p.* 228.):

" Conner, in a fixed loom, adopted the Davisson system, but with the Kitselman scheme of transfer by exclusively transverse motion of parts, thus demonstrating, for the first time, that Kitselman's purely transverse system was not inconsistent with an automatic transfer. Instead of using reciprocating shifters, after the manner of Kitselman, he made the side sections of his twisters self-transferring in virtue of their own motion as imposed by the purely rotating central portions of the twisters, the time and direction of transfer being controlled by switches directing the side sections into proper paths of transference. He retained the three-part twister and directly intergeared system of Kitselman. He provided his central sections with notched disks for supporting and driving the side sections, the transfers being effected by the side sections being automatically delivered up from the holding elements of one central section to the holding elements of another central section while all the parts were in motion, time and direction being controlled by the switches.

" The second claim of the patent would appear to have reference to a Davisson-Kitselman machine when the central sections are provided with holding elements capable of receiving, holding and discharging the side sections, the receiving and discharging being effected by the simple rotary motions of the central parts of the twisters, switches being provided to determine the time and direction of transference. The claim would appear to be limited to the automatic operation of the switches, but would appear to be independent of the prolongation of the hollow spindles into the twisting zone.

" The third claim would appear to differ from the second claim in being limited to the prolonged spindles, and as not being limited to switches operated automatically, so long as

they direct the transfers and the transfers are effected by the simple rotary motion of the twisters."

Pope Invention.

While the sectional construction of the Kitselman twisters enabled the convergent strain on the opposite spool-carriers to be, as it were, counterbalanced in the plane in which that strain is exerted, by reason of the fact that the central section was interposed between the outer sections in this plane, there would be a heavy downward stress on the central section due to the sag of the long warp wire, which would not be compensated for by this mutual support, and this would tend to press the interposed central section out of alignment. So long as the forward extension of this central section rotated with the other sections any wabbling in its bearing due to this cause would tend to deflect the central spindle from the proper alignment, for some looseness of the spindle in its bearing is necessary to permit its free rotation. If in order to prevent this wabble additional framework was provided for the forward end of the twisters, it obstructed access to the spool-carriers for the purpose of replenishing them, besides increasing the bulk of the machine. The warp wires extending through these spindles being stationary, and sagging heavily on the forward end of the tube, the rotation of the spindle at the outer end involved a frictional resistance from this sagging wire, which, not only consumed power to no purpose, but was injurious to the wire, as it tended to wear off the surface coating designed to protect it against rust. It was necessary that the cross-head at the base of this central section just in front of the gear should rotate in order to impart rotation to the shifting sections, but there was no such occasion for the rotation of the forward part of the central section. The object and effect of the Pope invention here in controversy was to avoid the rotation of the central tube where it would abrade the wire, and confine the rotation of the central section to that portion of it which was necessary to impart the proper rotation to the shifting sections, namely, the cross-head, at the same time preserving that contact of the three sections in the zone of twist which was necessary to offset the opposing strain in that zone, carrying the outer collars which supported the shifting sections at the outer end back to close proximity to their bases or inner ends, and dispensing with the forward portion of the framework which obstructed access to the spools. The Pope claims in controversy are as follows:

"1. In a wire fabric machine, the upright frame piece having a series of regularly spaced openings, stationary elongated

warp wire tubes fitted at one end in said openings, a vertically aligned series of intergeared twister wheels loosely journaled on said stationary tubes and having parallel face grooves, shiftable spool-carriers having tongues registering with the grooves in said wheels, and shifting devices for sliding the spool-carriers from one wheel to the other, substantially as set forth.

"9. In a wire fabric machine, the upright frame having openings, stationary warp wire tubes secured to said frame and aligning with the openings therein, a series of aligned twister wheels loosely journaled on said stationary tubes, and shiftable spool carriers mounted to slide on said wheels, substantially as set forth.

"10. In a wire fabric machine, the upright frame having openings, stationary warp wire tubes fitted at one end in said openings, a series of aligned twister wheels loosely journaled on said stationary tubes, and shiftable spool carriers having a sliding tongue and groove connection with the twister wheels, substantially as set forth."

The improvement introduced by this invention, and specifically embraced in each of the claims in controversy, is thus explained by Mr. See, (*R. p.* 231):

"In the Davisson, Kitselman and Conner patents the hollow spindles were rotary spindles, their outreaching forward ends, projecting into the twisting zone, being subject to side strains from the woof wires pulling sidewise upon the warp wires running through the spindles, and the spindles, if unsupported at their forward ends, being liable to run out of true, as the mechanics call it, if not accurately constructed or very closely fitted in the bearings in which they turned. In Fig. 1 of the Davisson patent notice that the front end of the spindles, notwithstanding they are kept well back out of the twisting zone, project far forward in an unsupported condition. They are rotary spindles and their nearest support is found at bearings of rotation where a certain degree of looseness must be had in order to permit of proper freedom of rotary motion. Kitselman and Conner provided, in some measure, for reinforcing support at the front ends of their rotary spindles, both following Kitselman's plan of projecting the spindles clear forward into the plane of twisting. In doing this, both Kitselman and Conner lost the advantage of the free outreaching system of Davisson which left his reels and reel carriers in position for ready accessibility. Let it be remembered that the woof wire is on these reels which require frequent replenishing. Davisson's reels were free and

open to the eye and hand at the direct front, being in fact far forward of the front end of the spindles. Kitselman and Conner projected the spindles, and in giving some support to their front ends they lost something of the merit of Davisson's frontally accessible reels. Pope combines the advantages of Davisson's frontally accessible reels with Kitselman's forwardly projecting spindles and he avoids any wabbling tendency of the front ends of the spindles by making the spindles non-rotary and causing them to furnish support for the central rotators of the twisters. This step at once introduced peculiar simplicity, stiffness, cheapness and accessibility into field machines for making netting. The intergeared system of twisters, and the three-part twisters, and the exclusively transverse system of Kitselman were retained. In Fig. 3 of Pope's drawings, A is the upright constituting the frame of the field machine; E indicates the hollow spindles with their heels secured rigidly in the upright, their forward ends projecting out rigidly into the plane of twisting. G indicates the intergeared rotators which are to drive the twisters, these gears running loose on the rear portions of the rigid hollow spindles. I and L indicate the reel carriers which project out boldly from the faces of the gears, the heels of these reel carriers engaging within the face of the gears so that they are carried and turned by the gears. The hand transfer system of Kitselman is adopted, hand shifters being provided to slide the reel carriers from one gear to another. It will be observed that the reels and reel carriers form outreaching structures, like Davisson's, and similarly present themselves accessible to the eye and hand of the operator. The spindle also projects into this frontal plane of twisting, but it is a rigid member, giving support to other parts, and giving rigid support to the transversely strained warp wires without imposing any rotary chafing action upon that wire.

"Referring to the first claim of the Pope patent: I understand the claim to refer to a field machine in which the upright frame piece bears rigid, hollow spindles projecting forwardly therefrom; intergeared wheels turning on the rear portions of such spindles; spool carriers projecting forward from the faces of the wheels; tongues and grooves, or equivalent devices separately uniting the heels of the spool carriers to the gears; and transfer devices for shifting the spool carriers from one gear to another. In Davisson, Kitselman and Conner the twisters were driven by gears and the cross-heads were separate from but in rigid driving connection with the gears, while in Conner the cross heads were formed directly upon the gears themselves so that the gears serve not only in turning the twisters, but in

carrying and forming the cross-heads by means of which the reel carriers were carried and rotated.

"Referring to claim 9: The claim would appear to refer to a similar structure, but regardless of whether or not the gear directly intermember, thus contemplating, perhaps, the Davisson system of driving the gears simultaneously by means of a rack, or possibly contemplating twister wheels having no teeth but arranged to be properly rotated by other suitable transmitting mechanism. And the claim would appear not to be limited to spindles secured to the upright by their heel ends, thus perhaps contemplating the possibility of extending them through and beyond the upright and into heel engagement with another supporting member at the rear of the upright. For instance, it is to be observed that Kitselman having hollow spindles, extends them clear through the upright and beyond, and into supporting engagement with a rear upright member, thus giving increased stability to the spindles.

"Regarding claim 10, it would appear that the claim refers to the same subject matter as the ninth claim, being, however, expressly limited to the support of the spindles by their heel ends in the upright."

Mr. Dayton explains the invention embraced in these claims as follows (*p.* 49):

"Finally taking up the Pope patent in suit, it will be observed that this patent illustrates improvements in the Kitselman or field type of machine. Looking upon the Pope as more directly an advance from the standpoint of Kitselman, the principal Pope improvements are two in number. One of these consists in making the hollow spindles themselves non-rotative, while the intermeshing train of pinion gears rotate about the axes of the spindles in order to revolve the mesh spools.

"This improvement is directly related to the field form of machine and in this relation is of much greater importance than might at first appear. In the first place, this improvement contributes materially to the case with which the machine may be operated, which is a consideration of great importance when the operation is to be effected by the hand of the same person. This result arises from the fact that the long tension wires which pass through the spindles, tend, by reason of their length and weight, to sag and bear heavily upon the inner surfaces of the spindles. If the spindles rotate the friction of such heavy bearing is added to the labor of the operator. On the front side of the machine this friction is increased by the strain of the

mesh wires upon the tension wires in the operation of twisting, tending to draw the marginal wires inward and the intermediate tension wires up or down as the tension of the mesh wires may vary. Hence, the making of the spindles non-rotative manifestly contributes to the ease with which the machine may be operated.

"Another important advantage of the non-rotative spindle relates to the fact that fence wire is protected against corrosion by exposure to the elements by being coated or 'galvanized,' as it is termed. The rotation of the spindles about these galvanized tension wires is liable to rub away the coating in spots and thus expose it to rusting, while the non-rotation of the spindles obviates this objection.

"The other of the two principal improvements made by Pope consists in providing for the detachable attachment of the spool-carriers or bobbin-frames directly to the series of pinions or intermeshed gears which revolve severally about the spindles. For this purpose Pope brings forward the front faces of the pinion (inside the gear teeth) and provides said front faces of the gears parallel T-shaped or dovetailed grooves, one on each side of the axis or spindles, each of said grooves receiving a T-shaped or other suitably formed tongue or projection on the inner end of a spool frame. The spool-frame inserted in these grooves of the pinion are, therefore, held up at their outer free ends solely by their connections with the gears.

"As a means of shifting the spools from twister to twister and holding them during the operation of twisting. Pope employs essentially the devices of the Kitselman patent, to wit, vertically sliding bars, movable on the main frame and suitably engaged with the shifting sections of the twisters, said sliding frame-pieces being moved by a hand lever, as in Kitselman, and not automatically or by operation of the driving crank, as in the Conner patent. . . .

"Referring to claim 1, the 'upright frame piece having a series of regularly spaced openings,' which forms the first element of the claim, is the main frame upright and the openings therein are the holes through said uprights into which are thrust and secured the rear end of the spindle tubes. Figure 3 of the Pope drawing is a section clearly showing the upright A provided with a horizontal hole D through it, into which hole is firmly screwthreaded the spindle E. Said spindle, thus secured to the upright frame piece A is non-rotative and affords an axle or journal on which the gear G is journaled to rotate, said gear being held inward to its place by a shoulder on the spindle E.

"The spindles are called in the claim 'stationary, elongated,

warp wire tubes fitted at one end in said openings,' namely, the holes in the upright frame. 'The intergeared twister wheels loosely journaled on said stationary tubes and having parallel face grooves' of the claim are the series of intergeared wheels G shown in section in Figure 3 and in front and edge views in Figure 4. A detached 'shiftable spool-carrier' is shown in Figure 5, M being its tongue or flange projection fitting in one of the grooves of a wheel and holding the carrier in a horizontal position by its base attachment to the gear wheel. The last mentioned element of the claim is 'shifting devices for sliding the spool carriers from one wheel to the other.' The generic expression of this element, taken in connection with the fact that the Pope patent follows the Davisson, the Kitselman and the Conner with their three different forms of 'shifting devices,' indicates to my mind an intention to be unrestricted to the particular form of shifting devices shown by Pope in his drawings. Any of the older and different forms of shifting devices answer the claim as well.

"Claim 9 calls for no comment except that it is to be noted that shifting devices are not mentioned as an element of said claim, but the shifting is referred to solely by the terms 'shiftable spool-carriers mounted to slide on said wheels,' referring to the recessed gear wheels.

"In claim 10 the suitable spool-carriers are said to have a sliding tongue-and-groove connection with the twister wheels," terms so broad as to be applicable to any form of inter-engaging recesses and projections by which the twister-wheel shall directly uphold the spool-frames."

INFRINGEMENT.

Appropriation of Plan and Constituent Elements Disguised by Formal Changes.

The charge of infringement rests not merely on identity of the result accomplished (as seems to have been assumed by the circuit court), but on substantial identity throughout in the means by which it is accomplished. Defendants' machine is unmistakably modeled after complainants', element by element, with studious care to retain the substance of each element in its individual character and performance and in its relation to other elements, as well as in its relation to the ultimate purpose; to effect the same result by the use of the same qualities in each member and the same mutuality of operation. Defendants have, as is customary with infringers who

start with a patented machine before them to purposely appropriate the inventions which give it character and value, made such changes in form and incidental details as they could without departing from the essential properties of either of the elements or depriving them of their necessary functions and capacity for co-operation for the purposes of the patents. The correspondence is such as to preclude the supposition that it was accidental, and it is significant that the defendant company was organized by men who had been personally associated with the manufacture and sale of the Kitselman machines, who had their machines before them as their incentive and guide, and who were familiar with their phenominal success. The prime movers in the Kokomo Company were Jesse H. Srofe, Harry Ward and John E. Frederick, who became upon its organization respectively president, vice-president, and secretary and treasurer. (*Dep. John E. Frederick, R., p.* 29, *A.* 85-88.) Srofe, the president, had for about seven years prior to 1896 (in the spring of which year the defendant company was organized) been continuously in the employ of complainants in the sale of their patented fence machines and was entirely familiar with their manufacture and sale. Ward, the vice-president, had been connected with the complainants in business at the factory where this manufacture was carried on, for about twenty months, having free access to the factory as well as the office. Frederick and all the organizers of and stockholders in the defendant company were residents of Ridgeville, Indiana, where complainants' factory was located. Theodore M. Conner, the patentee of the Conner patent in suit, who had sold that patent to the Kitselmans, was employed by defendants to assist them in the manufacture of the infringing machine. The individual defendants were jointly engaged in making arrangements to manufacture these machines prior to the date of incorporation and the manufacture was under way by July 14, 1896. (*Dep. Frederick, R., p.* 22, *A.* 1-8; *p.* 24, *A.* 21-36; *p.* 26, *A.* 49-89; *p.* 31, *A.* 111-113; *dep. Kitselman, p.* 90, *A.* 21-32; *see, also, dep. Ward, p.* 106, *A.* 21-23; *p.* 108, *A.* 55-57; *dep. George W. Frederick, p.* 101, *A.* 21-35; *p.* 103, *A.* 44-52.) The defendant company was organized for the purpose of carrying on this manufacture with a capital stock of only $6,000, non-assessable, all taken by Ward, Frederick and Srofe and Mary C. Srofe (commonly known as Kittie Srofe), who was the wife of Jesse H. Srofe. (*Articles of Incorporation, R., pp.* 20-22; *dep. John E. Frederick, p.* 24, *A.* 24-26; *p.* 29, *A* 89.) What, if any, part of the capital stock was paid for in money does not appear.

The bill charged that the individual defendants, being familiar with the complainants' machines and the fact that they were manufactured under patents, confederated together to start the infringing business, and incorporated the Kokomo Fence Machine Com-

pany, with a trivial capital, for the purpose of carrying on this infringment, distributing the profits accruing therefrom among the stockholders and avoiding personal liability therefor ; that the corporation had no substantial or visible or valuable assets sufficient to satisfy a judgment herein or to afford complainants any adequate remedy in a recovery of damages or profits sustained by reason of the infringement ; that the profits of the infringement were being distributed among the stockholders as they accrued and that the defendants entered into this corporation with knowledge of complainants' rights for the express purpose of carrying on the manufacture and sale of the infringing machines and avoiding responsibility therefor. (*R. p.* 6-7.) Evidence to suport such charges as relate to distribution of profits in absence of corporate assets can be properly taken only after the determination of the infringement and reference to the master for ascertainment of the extent of liability of the several defendants for damages and profits. When this cause was brought here, before this stage of the inquiry had been reached, the charges of the bill and the evidence (already cited) showing that the corporation was organized for the express purpose of manufacturing the infringing machines with an insignificant capital were sufficient certainly to entitle the complainants to an injunction against all the parties defendant (the defendant corporation, its officers and stockholders), and a reference to the master to ascertain the nature and extent of their individual liability for damages or profits, upon such evidence pertinent thereto as may be introduced upon such reference.

When a patented machine, especially one which, like the Kitselman, inaugurates a new art, is manufactured on a commercial scale, it usually takes on improvements either in the mechanical details of construction or by superadded and subordinate inventions. It is an unusual distinction of the Kitselman invention that the machine precisely as exhibited in the patent went immediately upon the market and into extensive use, and has continued to be manufactured and sold in this identical form ever since. The improvements of the later patents belonging to complainants, introducing certain additional advantages but retaining the primary inventions, have been incorporated upon the Kitzelman machine, and complainantts have in later years manufactured and sold a large proportion of these machines with these later improvements. The defendant company having begun its manufacture after all the patents in suit had been issued and acquired by complainants, included in their copy the inventions of the later patents as well as of the primary patents.

The court of appeals has by its opinion recognized the ~~rational~~ radical and comprehensive character of both the Kistelman and Davisson inventions and its findings clearly justify a decree in favor of com-

plainants under both these patents in respect to all the claims charged to be infringed. The opinion seems to have proceeded upon the theory that the relief given, embracing the essentials of the defendants' machine and carrying an injunction and account in respect to that machine, was so adequate as to relieve the court from any occasion to consider the other patents, and the opinion of the circuit court in respect to them was not reviewed. The circuit court proceeded on the assumption that changes in the shape of elements or in their path of travel or in the instruments by which motive power is transmitted, or in other parts of the machine not referred to in the claims, avoid infringement, notwithstanding the elements individually retain the same functions and relationship and cooperate with each other to secure the same result by virtue of the same properties, and that a patent for an improvement necessarily excludes the original invention. If these assumptions were true, they would destroy all practical protection under patents. They are directly opposed to the laws as administered by the supreme court and by most of the subordinate courts. I shall first compare the defendants' machine with the inventions embraced in each of the patents in suit, successively, then, after some reference to the law governing infringement, review more specifically the opinion of the circuit court. The findings of the court of appeals support complainants' contention in respect to the two patents which it examined.

Infringement—Davisson Patent.

Defendants' machine utilizes the invention embraced in the 2nd and 3rd claims of the Davisson patent, for precisely the purpose and with precisely the advantages of that invention as exhibited and claimed in that patent, thereby dispensing with all the disentangling mechanism required by the wire twisting machinery of the prior art. It corresponds in terms as well as in substance to each of these claims, though adding improvements thereon covered by complainants' later patents. It has the series of spindles arranged in line and mounted in bearings on a suitable supporting frame, with a cross-head on each spindle carrying reels for wire on opposite sides of the axis of the spindle, all being combined and operated together substantially as and for the purposes specified in the Davisson patent. The spindles are hollow and adapted to admit the passage through their axes of wire forming the edges of the fabric, and have all the elements specified in the 3rd as well as in the 2nd claim. The spindles project forward from the twisting gear, bringing the reel or spool holders on the "fighting line," as expressed by Mr. See. Instead of having the spindle revolve with the cross-head, the cross-

head is made to revolve on the spindle, but the relative office of the cross-head and the spindle is the same in either case and responds equally to the terms of the claims. By making the spindle stationary while the cross-head rotates on it, defendants have retained the elements and advantages of the Davisson while availing themselves of the additional advantage introduced by the Pope patent. Neither this, nor their use of improvements in the twisters and other features covered by the Kistelman patents, nor their use of improvements in shifting mechanism covered by the Conner patent, evades or justifies appropriation of the Davisson invention.

After explaining the Davisson construction and quoting the claims in suit, Mr. Dayton says, (*R., p.* 36):

> "It will be observed that the structure described in each of these claims is characterized by the arrangement and support of the mesh-pools or reels alongside and on opposite sides of the hollow spindle, also that claim 3 applies to two hollow spindles for marginal wires as well as for more than two spindles, whether the extra spindles be used only when narrower or wider fabric having only marginal wires is required, or otherwise, so long as the condition of the claim relating to the support of the mesh-spools transferably alongside the spindles is observed.
>
> "Claim 3, as I understand it, calls for more than two spindles for the tension wires, the words of the claim being 'a series of spindles arranged in a line.' Two would always be in a line with each other, but more than two might be out of line. Hence, the qualification 'in a line,' taken in connection with the drawing, (showing five of these spindles in a line), means unquestionably that the claim shall apply to a series of three or more hollow spindles.
>
> "The word 'bearings' found in claim 2, may, I think, apply to such support on a suitable supporting frame as will keep the hollow spindles in their proper positions in line with each other, parallel, and fit to bear or support the tension wires of the fabric at the required distance apart and in definite relation to the spools for the mesh wires which are to be wound about said tension wires.
>
> "Defendants' machine, in my judgment, clearly contains the elements and presents the conditions of both these Davisson claims in suit. It is a machine for making wire fabric and particulary for making meshed wire fencing, having either marginal tension wires only or tension wires intermediate to the marginal wires, and the fence fabric of either description may be made of various widths. It has these same capabilities of the Davisson by reason of the essentially same mechanical elements.

That is to say, 'a series of spindles (hollow spindles) arranged in a line and mounted in bearings on a suitable supporting frame,' said hollow spindles being 'adapted to admit the passage through their axes of wires forming the edges of the fabric;' and each of said hollow spindles has a cross-head or part extending both sides of the spindle for 'carrying reels for wire on opposite sides of the axes of said spindles.' Defendants' machine, therefore, answers to both claims 2 and 3 of the Davisson patent.

"There are obviously formal differences between defendants' machine and the machine illustrated and specifically described in the Davisson patent, but these, in my judgment, cut no figure in this comparison, which is made on the assumption that the combination stated in claims 2 and 3 of the Davisson patent are not anticipated, and that consequently said claims are not dependent upon specific formal features found in the particular embodiment of the invention illustrated in the Davisson patent drawings. Moreover, the changes made in the defendants' machine are, in my judgment, for the most part those which have been invented by Kitselman, Conner and Pope, and which are embodied in the three patents in suit granted to these persons, respectively. This being the fact, I shall have occasion to refer especially to these changes or differences in comparing defendants' machine with the patents to Kitselman, Conner and Pope and need not, therefore, particularly refer to them further in connection with the Davisson patent."

Mr. See says (*R.*, *p.* 234):

"Defendants' machine is unquestionably a netting loom and is unquestionably a netting loom of the Davisson type, of the type radically distinguishable from netting looms of the art prior to Davisson, for it has its woof reels mounted right in the twisting zone where they themselves form the twisters, the gears for rotating them being to the rear of them, there being no rear woof reels and fatal rear twisting conditions and necessary rear twist-preventing mechanism, as was found in all netting machines prior to Davisson. And the spindles of defendants' machine are all hollow and adapted for and obviously intended for and, as I understand, always used for carrying intermediate warp wires, the machine thus being capable of having a given twister deal with three wires simultaneously so as to intertwist two woof wires together and twist both of them around an intermediate warp wire. It would appear clear that defendants' machine was founded on the teachings of the Dav-

isson patent, and that nothing in the art prior to Davisson contained teachings on which it could have been founded. Defendants' machine is a Davisson machine."

Defendants' expert predicates his argument on the question of infringement upon the assumption (elsewhere shown to be purely imaginary) that the prior Nesmith and Sedgwick patents corresponded with the Davisson except in minor details of construction, and that the claims sued upon must, therefore, be limited to the specific means of attaching and shifting the carrying reels, and to other details of construction not mentioned in the claims. This argument loses all significance when the vital character of the Davisson invention is recognized and the misconceptions of this expert concerning the relations which it bears to the prior art are exposed. This is more particularly referred to under the prior title of "The Patented Inventions" and the subsequent title of "Novelty and Scope of Complainants' Patents."

The special means of attaching and supporting the carriers on the cross-heads illustrated in the Davisson patent, and the special means of shifting the parts, are elements made the subject of other claims, which, for that reason, are not included in the charge of infringement. The claims that are included are plainly intended to cover the elements specified in them when combined with each other so as to perform in the machine the office of twisting the wires into mesh in the manner and for the purpose exhibited and described in this patent, irrespective of the special means of shifting or of attachment, which are embraced in other claims. If the second and third claims had been intended by the patentee or the patent office to be limited to the construction of the shifting mechanism, or to the precise manner of attaching and detaching the reels to and from the cross-head, those elements would have been named in these claims, or, rather, these claims would be unnecessary because those elements had been sufficiently designated in other claims. If, as the prior art abundantly shows, Davisson was the first to build any wire-fabric machine in which spindles, projecting forward from the gear which rotated them, were provided with a cross-head in front of such gear carrying reels for wire on opposite sides of the axis of that spindle, he was entitled to claim broadly the machine having these elements thus arranged and operated to secure the purposes set forth as the object of his invention. If he provided and illustrated (as he did) operative means for rotating these cross-heads and shifting these spools, so that the whole machine was exhibited in practically operative form, he was not obliged to limit his claims for the broad invention to the particular construction of the shifting machinery or to the specific construction of any of the elements by

which this novel result was secured. If the rule were otherwise, it would be impossible to protect the inventor of a complicated machine in the substance of his invention, since the broader the invention the easier it is for an infringer who is purposely copying it, in whole or in part, to modify portions of the machine or substitute for minor parts equivalent elements that are, individually considered, quite unlike those for which they are substituted. It is only by claiming broadly those elements which the patentee was the first to combine in such manner as to work out his result, and then claiming more specifically, in separate claims, elements which are associated with them and which may be greatly varied without altering the essential character and performance of the main elements, that any such invention can be protected. The words "substantially as specified," when used in connection with the primary elements which co-operate to perform a useful purpose which they have not before co-operated to perform on the same general plan, merely limit the claim to such elements when co-operating with each other to perform in the machine the particular service which they are shown and described in the patent as performing, the limitation being to their manner of co-operation with each other and the effect which they produce in the function of the machine, rather than to such incidents of their construction or their actuation as may be greatly varied without depriving them of the capacity to perform the new service which is obtained by their co-operation in the patented machine. Defendants' expert, Mr. Wiles, practically recognizes this when he appeals to the prior art for the purpose of imposing upon the claims limitations not expressed in them, but he fails in this appeal because the prior art shows Davisson to have been the first to accomplish the twisting of the mesh of any wire fabric by the mechanism specified in either of the claims, without reference to details of construction or the particular means used for transposing them.

Mr. See and Mr. Dayton have pointed out many of the misconception and fallacies in the argument by which Mr. Wiles seeks to read these limitations into the Davisson claims, in evidence heretofore cited under a prior title. Referring again more particularly to this subject, Mr. See says (*R.*, *p.* 236):

> "Mr. Wiles thinks defendants' machine and Davisson's are radically different 'except in so far as they embody the broad principle of construction and operation of the Nesmith machine.' I think it should be apparent that defendants' machine and the Davisson machine are alike in the very fact that they both similarly depart from the very principle of construction and mode of operation of machines of the Nesmith class, defendants'

machine and the Davisson machine falling into a class representing an abandonment of about everything found in the Nesmith class of machines, except woof reels, and rotary motion of wire to produce twisting.

"Mr. Wiles considers that defendants' machine has no spindles in the sense of the Davisson patent. He finds defendants' spindles to be rigid and non-rotary, according to the Pope patent, while in Davisson's machine they are rotary. He considers defendants' fixed spindles as frame elements, rather than twister elements, and thinks the same results might be accomplished by rearwardly projecting hubs on the gears, thus likening the gears to the gears of Nesmith. But it is a mistake, I think, to look upon these spindles merely as frame elements. They are elements essential in the mounting and rotation of the rotators of the twisters, of the cross-heads which carry the woof reels around in their orbits. The purpose of Davisson's spindles is to effect proper association between the driving mechanism of the machine and the orbitally moving woof reels, and between the several sets of woof reels. The presence of rotary motion involves a journal and a bearing, and either may have the rotary motion while the other member is fixed, as has been long recognized in the common arts. In defendants' machine there is at each twister necessarily a motion of rotation, and there is at each twister a journal and a bearing to permit of this motion. In the Davisson machine the bearing is stationary and the journal rotates, while in defendants' machine the journal is stationary ,and the bearing rotates without in any manner or degree modifying the qualities of the rotary motion essential to be given to the cross-heads which carry the woof reels. At the center of each of defendants' gears is a hub forming a rotary bearing and turning upon a stationary journal, and these hubs, these rotary hubs, might be looked upon as rotary spindles, being the rotary parts nearest the axis of rotation and serving in giving support and axial guidance and control of the essentially rotating parts of the system, namely, the cross-heads which carry the woof reels. I should say that defendants' machine was a Davisson machine involving precisely the same necessities for rotary motion and providing support and guidance for that rotary motion by substantially the same means, namely, a journal and bearing, one fixed and the other rotary, and that the full rotary office of Davisson's spindles was found in corresponding rotary members in defendants' gears, these rotary members being hollow or provided with axial passages.

"Mr. Wiles distinguishes between the spool carriers of Dav-

isson and the spool carriers of defendants' machine, on a fancied line of 'a difference of principle of their operation.' There is no such distinction. In each case the reels are spools turning on their axes; spools mounted in front of the driving gear; spools with their axes at right angles to the axes of twisting motion. And in each case the reel carriers are structures supporting the pivots for these reels. And in each case the reel carriers serve in supporting these reel pivots in temporary union with one or another of the twisters and in carrying those pivots and their reels from one to another of the twisters. And in each case the reel carriers surround and partially enclose the reels. And in each case the reel carriers have frontal eyes in the twisting plane through which pass the woof wires from the reels. In each case the reel carriers perform the twisting of the woof wires about themselves and about the warp wires. In each case the reel carriers have the same orbital motions in performing the twists, and the same motions of transfer from one twister to another. There is no difference in the principle of construction or operation of the reel carriers, as reel carriers, in the two machines.

"Mr. Wiles considers the two machines differentiated by reason of the difference in the manner of shifting the reel carriers. But the result of the two systems is the same, a given reel or pair of reels being carried in an orbit by the cross-head of the twister until the proper twisting is completed, after which the reels leave this cross-head and move bodily to the cross-heads of contiguous twisters where they perform a similar twisting operation under new conditions of couplings of reels. In the Davisson machine there is moving mechanism or transfer to bring about the transfer of reels from one twister to another, and Mr. Wiles thinks defendants' machine is totally void of transfer mechanism. Defendants' machine has transfer mechanism involving the rotary gears and also involving special movable switches to direct and control the transfer, as will be later explained. That defendants' machine accomplishes the transfer of reels by transverse movement only, and by the utilization of the rotary motion of the driving gears, is due to the fact that Kitselman and Conner have been drawn upon.

" Mr. Wiles expresses the opinion that the Davisson patent is not high in the art, and that defendants' machine is alike to it only in old respects. This I think utterly erroneous, and for reasons which I think have been sufficiently given, reasons inevitably leading to the conclusion that Davisson's departure from the prior art was as radical as anything of which any art gives us an example. The likeness between the Davisson ma-

chine and the machines of the prior art is to be found entirely in the mere fact that wire netting is to be produced by twisting action; after that all similiarity ceases."

Mr. Dayton, after pointing out and illustrating the vital distinctions between the combination of these claims and the nearest approaches which defendants' expert claims to find in the prior art (*R., pp.*, 265-272), concludes as follows (*p.* 272):

"From the foregoing comparison of the Davisson Machine or invention with the prior art it seems to me clear that Davisson made a most radical departure from the prior art and that his invention, in view of its radical differences from the prior art and of its results in making a new form of fabric possible and of begetting a new line of inventions (as shown by the improvements thereon set forth in the other patents here in suit, not to mention defendants' machine), is to be fairly regarded as of revolutionary character. This Davisson invention instead of being restricted to the terms of the claims, is on the other hand, in my judgment, much broader than these terms, and if the terms of the claims in suit were not ample to embrace the structure found in defendants' machine, said claims would, in my opinion by reason of the pioneer character of the invention, be entitled to such interpretation as would unquestionably include said defendants' machine.

"The claims in suit are, in part, in terms of spindles. In claim 3 the spindles are defined as 'hollow' spindles. These claims evidently might have been more broadly expressed. But defendants' machine has the spindles, and it is no departure from the claim in this particular. Both claims locate the mesh wire spools at the sides of the spindles by the terms, 'having on each spindle a cross-head carrying reels for wire on opposite sides of the axis of said spindle.' Not only were the spindles new in the art with Davisson, but mesh wire spools or 'reels for wire on opposite sides of the axis of said spindle,' and therefore in front of the gears, for revolving the reels, were new with Davisson. And defendants' machine has this feature also. Both claims specify a 'cross-head' on the spindle for carrying the 'reels for wire.' The patent in fact shows on each spindle two cross-heads, either one of which is, to a mechanic, obviously available for 'carrying' these spools or reels around the spindle axis. One cross-head shown in the patent is the gear wheel and the other is the cross bar or pair of arms at the free front end of the spindle. It is to the cross-head at the free end of the spindle that Davisson has shown his mesh wire spools attached. De-

fendant attaches his mesh wire spool to the other cross-head, namely, to the gear wheel. In both the Davisson patent and defendants' machine the mesh wire spools are, therefore, revolved about the axis of the spindle by the same primary means, to-wit, the gears. There is, consequently, no departure in defendants' machine from the Davisson invention as expressed in the two claims in suit.

"Defendants' machine having these same essential elements of the Davisson structure and specified in the claims in suit, including the series of hollow spindles arranged in a line, as shown in the Davisson patent, is capable of making and does in fact make the particular fabric above referred to and first producible in the art by the Davisson machine. It is therefore the Davisson machine in essentials of structure and in product."

In a subsequent answer, he points out with more particularity the errors into which Mr. Wiles has fallen concerning the supposed limitations of the prior art, and the imaginary and misleading character of the model and sketches which he has introduced to illustrate his argument. (*Dep. Dayton, R., pp. 273-283, A. 5.*)

Infringement—Kitselman Patent.

Defendants' machine responds in terms and substance to the claims of this patent under which infringement has been charged. It has the sectional twisters each comprising a central section for carrying the warp wire, having rotary movement imparted thereto, and shifting sections for carrying the weft wire and receiving rotary motion from the central section to form the twist, the construction of the individual elements and their relation to each other being substantially such as is described in the patent and for the same purpose, and it has each of the other elements combined with these, as specified in other claims in suit. The central sections and the side sections are in contact on the line taken through the wire discharge openings at the forward end of the three sections, as well as at the rear end, so that the convergent strain upon the side sections is neutralized by the interposition of the central section in the plane in which this strain occurs, the opposing strain upon the two side sections being thereby offset one against the other through the continuous head formed in the zone of twist. The parallelism of the side sections or shifting sections is thus maintained, deflection on the warp wire in the plane of twist is prevented, the woof wires supported at uniform distance from the center in that plane, and

the converging leverage which would otherwise tend to deflect the heads of the sections toward the center is thus counteracted, as in the Kitselman composite or sectional twisters. Defendants have given different outlines to the heads of these several sections, taking care, however, to preserve the capacity for continuous support in the diametrical line taken through the three wire apertures, which is the prime object of the sectional construction. The patent under which they claim to manufacture, and under which their machine is marked, lays stress upon this characteristic, saying (*Whitney patent No.* 552-025, *R., p.* 510):

> "Although the spool-carriers are supported only at the lower end and at some distance from the spools themselves, it will be noted that the wires *g* draw from the aperture in the cross-piece F^5 to the longitudinal strand, in the direction of the length of said cross-piece, and that while the carriers are being transferred and are rotating the end of the cross-piece is against and turns about the tubular extensions D, as seen in Figs. 1 and 2, thereby preventing the carriers from dropping out."

It is by maintaining the axial parallelism of the three sections against the converging strain that the "dropping out" of working position is prevented.

Defendants have changed the shape of these heads or cross-pieces corresponding to F^5 from the outlines exhibited in the patent under which they claim to manufacture quite as much as from the shape exhibited in the Kitselman patent, but have retained this capacity for mutual support, which is the essential purpose of this sectional construction in each case. They are thus enabled, as in the Kitselman patent to project the shifting sections in front of the cross-head and support them against the converging strain by mutual engagement on the diametrical line, in the zone where the converging strain is exerted.

The three sections form a practically solid integral twister during their rotation, and the side sections, when in the proper arc of rotation (as in the Kistelman), are brought into registration with guiding surfaces, which permits their being transferred at will in a vertical plane (without intermediate longitudinal movement) and brought into the same composite relationship with the central sections above and below them, respectively, with which they establish the same practically integral character during the period of their rotation. Defendants have availed themselves of the Conner device for automatically switching or transferring the sections, and also of the Pope invention, by which the rotation of the central section is confined to the cross-head, which turns on the spindle as a bearing,

this spindle remaining stationary. But these are only superadded improvements which do not conflict with, or deprive the mechanism of the advantages secured by the Kitselman invention. The Whitney patent No. 505,890 (*p.* 504) copied the Kitselman shifting mechanism while No. 552,025 (*p.* 507) substituted a close imitation of the Conner shifting mechanism, stating that its object was to shift the twisters "automatically."

Defendants' expert lays stress on the fact that the heads of the several sections of defendants' twisters have not the "segmental" form exhibited in the Kitselman patent, and that the shifting mechanism is not the same. It is a sufficient answer to this to note, *first*, that certain of the claims of the patent, not charged to infringe, have the additional limitation to "each side section having *segmental* heads," or to "the side sections in contact with the central section and having the *segmental* heads, and with their flat sides in contact with the central sections," such claims being distinguished by these limitaitons from those here in suit (see claims 14, 16 and 19); *second*, that certain of the claims not charged to be infringed contain the further limitation to the sliding, shifting mechanism; *third*, that the claims in suit are plainly intended to avoid these specific limitations, their omission from these claims being emphasized by the other claims thus contrasted with them; *fourth*, that the prime object of the sectional construction is secured irrespective of whether the heads have the shape illustrated in complainants' patent or that used by defendants. Complainants have confined their charge of infringement to those claims which do not contain these limitations.

The correspondence of defendants' construction with each of the Kitselman claims in controversy is more particularly explained by Mr. Dayton as follows, after citing these claims (*R.*, *p.* 41):

> "It will be observed from these claims that Kitselman embraces in the term 'twister' three general parts, one of which includes the hollow spindle, and each of the others of which includes a detachable and transferable spool-carrier and a spool for a mesh wire mounted rotatably on said carrier. The first of these sections he calls 'central sections' of the twister and the other two the 'shifting sections. In each of the claims in suit it is specified that there shall be 'a series' of these three-section twisters, and, by implication, I think the central and driving sections of all these twisters are longitudinally stationary, in distinction from the longitudinally movable twisters of the Davisson patent, so that all the twisters in the series, including the detachable spool sections thereof, are at all times maintained in their same longitudinal position. The side sections are given their rotary motion by the rotating central sections, the inter-

meshed driving gears being connected with the central sections only and the side sections being so conformed to the central sections that, upon rotation of the latter, the side sections carrying the mesh spools are revolved to form the twists. In this particular embodiment of the Kitselman invention the hollow spindles themselves revolve along with the gears and, to communicate revolution to the side sections of the twister, said spindle is provided with parallel sides, laterally projecting arms, against which the straight inner faces of the side sections bear. Externally, the side sections at their ends are given parti-circular form, so that when standing alongside the central section, the three together have a circular boundary. Vertically sliding strips are provided in the frame, having parti-circular recesses which fit the curved edges of the side sections so as to confine the three sections together and, when so confined, the rotation of the central section by its connected pinion or gear wheel involves the rotation or revolution of the side sections with it in the confining recesses of the sliding frame pieces referred to. After a twist of the mesh wires about the tension wires, the movement of one of the sliding frame pieces upward and of the other of said frame pieces downward, carries the two side sections of the twister into connection, one with the superjacent and the other with the subjacent, central section and spindle of the apparatus, preparatory to a similar twisting of the mesh wires about the neighboring tension wires. The machine is, of course, advanced along the tension wires between the twisting operations, and the same side sections of the twisters are alternately brought back into operative engagement with the central sections with which they were previously engaged. In all cases the rotary power is applied to the central sections of the twister and is communicated therefrom to the detachable and shifting side sections.

"As will be observed (especially from figure 4), and as stated in the patent, the central section of each twister of the vertical series is supported only at its inner end and its outer end is free. Also, the pinion for driving each central section is rigidly fastened to the shaft by which said central section is supported and rotated. The pinions of all the twisters being thus secured and directly geared to each other, the rotation of any one of them gives rotation of all, and alternate twisters necessarily rotate in opposite directions. In the drawings, a hand crank is shown at a convenient height from the ground, having on its shaft a beveled pinion engaged with a beveled spur on one of the twister shafts by which motion is communicated to all the twisters simultaneously.

"It is understood that at the top and bottom of the machine there will be a rotary central section of a twister which will receive one spool-carrier only for the application of a mesh wire to the top and bottom marginal wires of the fabric, and that this spool will be present and rotate with said central portion only when the mesh wire is to be carried about said marginal wire, while at other times, or in other words, when said mesh wire is to be carried about the next inner tension wire or twisted with the next inner mesh wire, the upper or lower central section of the twister will revolve empty of a spool. It will also be understood that, as in the Davisson machine, any two of the twisters may carry the marginal tension wires and that spools may be omitted from those above or below, and also, as the Kitselman patent illustrates and describes, spools may be applied in pairs to all the intermediate twisters or to alternate ones in making different varieties of fabric. The spools being detachable, various changes in the mode of using the machine for the production of different styles of fabric may be made.

"Defendants' machine, in my judgment, contains the inventions of the Kitselman patent recited in the above enumerated claims, as well as the inventions of the Davisson patent, as already pointed out.

"Defendants' machine is a hand-operated field machine which, in my judgment, could not have been made as a departure from the Davisson machine without the adoption of the Kitselman ideas and inventions, and in my opinion it contains said ideas and inventions of Kitselman specifically, as to their essentials. It differs therefrom only in form and by the embodiment of additional inventions mainly set forth in the Conner and Pope patents here in suit. There is no departure therein from the essential principles of the Kitselman invention as recited in the claims in suit, in any particular.

"In defendants' machine the twisters, including the series of hollow spindles, are arranged in a vertical line with each other and are supported by a suitable upright frame. Each of the twisters is composed of three parts or sections, the central section of which is stationary longitudinally and as to its position, but which is rotatable upon its axis, at least as to so much of it as needs to rotate. Each of these rotatable central sections contains, or has connected therewith, a pinion which is directly meshed with the corresponding pinion of the adjacent sections. Each of the twisters, or as many of them as it may be desired to use, is provided with detachable and shifting sections, each composed of a spool-carrying frame or part and a rotatable spool for a mesh wire. All the twisters used at any time are simultane-

ously revolved by a single hand-crank placed in the position shown in the Kitselman patent and geared to one of the twisters. The spool-carriers of each twister are outwardly flush or substantially flush with the free ends of the spindles, so that the twisting of the mesh wires about the tension wires which extend through said spindles is performed adjacent to the points where the spindles support the tension wires at their proper distances apart. The machine being an embodiment of these improvements by Kitselman, has the general proportions, the lightness, compactness, portability and the easy manageability of the Kitselman, and it is correspondingly provided with means for giving it a regular step-by-step movement between the operations of twisting so as to give to the upright fabric which it forms in the field the regularity and symmetry of the factory-made fabric as accomplished by Kitselman's machine. The propelling mechanism of defendants' machine takes hold of the stretched tension wires instead of taking hold of a rack upon a ground plank, as I understand Kitselman did in his own machine long prior to the construction of defendants' apparatus.

"It is not material, in my judgment, that defendants' machine presents formal differences from that illustrated and specifically described in the Kitselman patent. For example, it is not material that the side or shifting sections of the twisters in defendants' machine are held to the rotary central section (so as to derive motion therefrom), by other means than the recessed vertically-sliding frame pieces shown in the Kitselman patent, because none of the claims selected from the Kitselman patent for this suit embraces said sliding frame-pieces as elements or is dependent upon them. Nor is it material, in my judgment, that the shifting sections of the twisters are transferred from one twister to another by other means than said sliding-frame pieces. The Kitselman claims in suit are generic in their terms relating to these and similar maters. For example, in claim 1 the side transferable sections are referred to solely as 'the shifting sections for carrying the weft wire and receiving rotary motion from the central sections to form the twist.' In claim 2 they are referred to as 'side portions capable of a compound movement —that of rotation on their axes—and of a shifting longitudinal movement (meaning up and down movement).' In claim 9 they are referred to solely as 'side sections.' In claim 10 they are mentioned as 'side sections, each side section carrying a spool or reel for the wires.' In claim 11 the side sections are referred to as a part of the twisters and as carrying a spool. In claim 15 the shifting sections are spoken of only as 'two side sections which are capable of a shifting movement indepen-

dently of the central sections, in opposite directions simultaneous, whereby the said shifting sections of one twister are adjusted to register with the central sections of twisters on opposite sides of the same,' and in claim 20 they are spoken of as as 'the shifting side sections adapted to align with the central sections to be rotated therewith.' Defendants' machine answers to all these conditions of all the claims in suit relative to the shifting spool-carrying sections of the twister.

"Nor is it material, in my judgment, that a part of the central section in defendants' machine, to wit, the part called the hollow spindle and forming the wall of the hole through which a tension wire may pass, does not itself rotate, as shown in the Kitselman patent. The essential thing in this spindle is that it is a walled hole, and it is is immaterial to the hole whether the wall rotates or not. It is an advantage to the fence and not to the ease of operating the machine that the wall of the hole shall not rotate, as Pope discovered and sets forth in his patent in suit. But it is not material to the carrying of the side or shifting sections of the twisters, or to their shifting action, or to their revolution about the spindles, or to the performance of any of the functions or to the perfection of any of the combinations specified in the Kitselman claims in suit, that the hollow spindles themselves shall rotate, and hence, in my judgment, defendants' machine does not escape the Kitselman claims sued on by reason of the non-rotation of the spindle itself. In the Kitselman construction it is not merely the rotation of the spindle that causes the rotation of the shifting sections of the twisters, but it is the rotation of laterally projecting parts attached to the spindle. To disconnect these parts and to rotate them alone while leaving the spindle non-rotatable, would give precisely the same results, so far as carrying, the revolution and the shifting of the shifting sections of the twister are concerned.

"Hence, understanding the words, 'substantially as described, for the purpose set forth' of the claims to have reference to the purposes broadly stated in the patent and by which the Kitselman machine is distinguished from the Davisson as a producer of the same kind of fencing fabric, defendants' machine repsonds clearly and completely to each of the above enumerated claims of the Kitselman patent."

In comparing defendants' machine with these claims, Mr. See says (*p.* 235):

"Defendants' machine is a portable field machine for mak-

ing netting fences *in situ*, and for making the Kitselman fences *in situ*. It embodies improvements wrought by Kitselman upon the Davisson machine adapting the Davisson machine to such use. It extends the front ends of the hollow spindles forwardly into the twisting zone, into the vertical plane of the eyes of the woof twisters formed by the reel carriers. It employs three-part twisters involving a central section for carrying the warp wire and rotating the side sections, the central section having a fixed position, and shifting side sections transferring from twister to twister by transverse motion only. As a preliminary to the shifting of side sections, the cross-heads or carrying members of the twisters are brought into alignment or register, and this is accomplished by angular motion only of the central sections of the twisters, and by means solely of the simple mechanism which is employed in giving the twisters their regular rotary twisting motion. The twisters are so far separated from each other that their orbitally moving woof reels will not interfere with each other, and the entire series of twisters is rotated, both in performing the twists and producing conditions essential to shifting, by simple spur gears fast on the central portions of the twisters and directly intergearing with each other. Mechanism is provided for the shifting of the side sections from one central section to another without involving longitudinal motion of the central sections. Defendants' machine thus appears to embody improvements superposed by Kitselman upon the Davisson machine to adapt it to portable and field use in the weaving of netting and Kitselman fencing."

Again, speaking of the distinctions defendants' expert seeks to draw, Mr. See says (*p.* 238):

"Regarding the Kitselman patent, Mr. Wiles has founded his distinctions between the defendants' machine and the patent upon his understanding of the prior art and, as heretofore explained, his apprehension of that art appears erroneous. I do not think I need to repeat what I have heretofore said on this subject in answer to the previous question. Mr. Wiles, for instance, expresses the opinion that Kitselman's twisters are more like Nesmith's than like defendants'. Nesmith's twisters are slotted gears far in front of their reels, the reels doing no twisting, and their location calling for rear twist-preventing mechanism. Kitselman's twisters and defendants' twisters, on the other hand, involve no slotted gears; the reels and their carriers themselves form the twisters; they are clear to the front in the field of twisting; and there is no troublesome rear.

"Mr. Wiles appears to think that the Kitselman three-part twisters essentially involve a rotary spindle in the central part. I think he quite overlooks the fact that the rotation of the central part of the twister has nothing to do with the performance of that central part in carrying the warped wire, and that rotation is an essential attribute only of the cross-head, which drives the side sections in their orbital paths. This will, I think, be readily appreciated if we turn to Fig. 4 of the Kitselman drawings and assume a warp wire passing through, say, the upper twister. The central portion of that twister turns and, consequently turns on the warp wire passing through it, the front face of this central portion supporting the warp wire in the plane of twisting. But the rotation of this central portion has not a thing to do with the support of this wire. For instance, assume a tube slipped over the rear portion of the wire and pushed forward through the twister so as to form a non-rotary lining therefor. The twister would not then rotate against the wire, and the wire would be in contact only with the stationary tube, but every office of the central portion of the twister in supporting the warp wire would be performed as fully as before and, indeed, better, for there would be no rotary chafing of the wire. Therefore the spindle of the twister in its performance in connection with the warp wire involves no necessity for rotation. The central section of the twister drives the side sections in their orbits. At the rear of the spindle is the cross-head I', which is engaged by and drives the side sections. At the front of the spindle is a similar cross-head giving supplemental transmission and support for the side sections. Now, cut the spindle off just forward of the rear cross-head and remove the cut off portion. The side sections will be driven as before, it thus becoming apparent that the driving of the side sections in their orbits is not only not dependent on rotation of these projecting spindles, but is not dependent on their presence. But proper support of the side sections so that they may be properly moved in their orbits by the central sections would appear to be dependent on frontal support for the side sections, as is the case also in defendants' machine in which the forward portions of the side sections have supporting engagement with the extreme forward end of the spindle of the central sections. The fact that defendants' spindles are non-rotary is traceable directly to the fact that the Pope patent has been drawn upon.

"Defendants' machine is founded on the purely transverse transfer of the side sections as in Kitselman, but Mr. Wiles appears to be of the opinion that defendants' machine is differentiated from the Kitselman patent by the fact that Kitselman's

specific shifting mechanism had not also been adopted. The Kitselman claims in suit do not limit themselves to the Kitselman specific shifting mechanism, and it would appear that defendant's machine, in adopting the Kitselman system of shifting, by transverse motion only, had departed from Kitselman's shifters working by hand-lever and had adopted the Conner system of shifting by the direct rotary action of the gears under the controlling direction of supplemental switches.

"It appears clear that defendants' machine has the three-part twisters of Kitselman arranged to deal at one time with three wires directly in the twisting field; that the shifting was effected after the system of Kitselman, by transverse motion only; that the central sections of the twisters give the orbital motion to the side sections; that the conditions precedent for transfer of side sections are brought about exclusively by the operation of the rotary motion only of the twisters, and that the central portions of the twisters are directly intergeared, defendants' machine thus being founded on the Davisson patent and embodying also features of improvement invented by Kitselman."

See, also, Mr. Dayton's testimony concerning the distinctions referred to by Mr. Wiles (*R., pp.* 293-295.)

Infringement—Conner Patent.

The defendants, following the plan of Conner, construct their cross-heads with guiding grooves, which are, at a certain stage of the revolution of the twisters, brought in registration so as to afford the tongues of the side sections a path of travel in substantially the form of figure "8," also providing automatic switches which, under the actuation of the driving gear, as driven by the hand crank, shift the spool-carrying sections from the central sections with which they have been co-operating to the adjacent central sections above and below, passing them into the corresponding grooves or guides on the respective cross-heads. They not only follow the plan of the Conner patent in respect to the provisions for automatic shifting, but adopt a construction which responds literally to the terms of each of the claims, with the single exception that, instead of placing the outer spool-carrying discs on the central section and providing the spool-carriers with journals that fit in the notches thereof, they reverse this construction, placing the notched discs on the spool-carrying or outer sections, and the journal bearing, which fits into the notches of these discs, on the central section, the effect being identical. This reversal of parts without change of function is one of those obvious

imitations which is immediately recognizable as a mechanical equivalent.

The patent under which defendants marke their machine states as its primary object the provision of a simplified machine, "in which the transfer of the spool-carriers, sometimes called 'twisters,' from one plane to another is accomplished automatically." (*R.*, *p.* 507.)

After explaining the invention of the Conner patent, Mr. Dayton describes the correspondence of the defendants' machine to each of the claims in suit as follows (*R.*, *p.* 46):

> "With this explanation it will be apparent that defendants' machine contains the subject matter of claims 2 and 3 above quoted from the Conner patent. In other words, defendants' machine has 'a train of intermeshing gears, arranged in line,' and for each gear 'a hollow shaft forming the axis of the gear.' In defendants' machine there are also two notched, spool-supporting or carrying discs, one of them mounted on the spindle or hollow shaft adjacent to the gear and the other transferred from the hollow shaft to the bobbin-frame. That is to say, instead of putting a notched disk on each end of the hollow shaft or spindle, defendants have put one such notched disk on their hollow shaft at its base and adjacent to the gear, and have put the other on the outer end of the bobbin-frame. Of course, it is entirely immaterial to the accomplishment of the end in view whether the hollow shaft or spindle holds the bobbin-frame parallel therewith at a proper distance therefrom by something attached to the spindle and bearing against the spool-frame, or by something attached to the spool-frame and bearing against the spindle. The very presence of one of these at one end of the spool-frame or spindle and of the other at the other end, shows their perfect interchangeability, and their substantial identity for the purpose stated. Defendants' machine, therefore, in my opinion, contains the element expressed in the Conner claims by the words 'notched disks,' or by the words 'spool-carriers mounted on said hollow shaft and having notched disks,' or by the words 'notched spool-carrier disks mounted on said hollow shafts.' In part, defendants' construction is identical with that of the Conner patent, and for the rest it has the equivalent.
>
> "Defendants' machine also has an automatic transfer of the bobbin-frame from one twister to another, so that said bobbin-frames 'are simultaneously withdrawn from the notches' of the disks by which they are held in one twister and lodged in the notches of the disk of the adjacent twister by which they are similarly held and carried round.

"The means by which this automatic transferring or shifting is accomplished in defendants' machine are formally different from those shown in the Conner patent, but they effect the same result, and I know of no restriction upon the word 'switch' which stands in the way of its application to defendants' device for this purpose, as much as to the device of the Conner patent, for the same purpose. In the Conner patent Figure 1 shows the so-called switches (at 19) in their relation to the projections 13 on the bobbin-frame as the latter are seen to rest in the notches of the disks 7 belonging to the several twisters. These so-called switches 19 are the extremities of centrally pivoted levers which are vibrated by the rods 20, 20a, through a connection 21, and other details of mechanism connected with the driving machinery. When the disks and bobbin-frames are out of the position in which they are shown in Figure 1 the switches 19 are vibrated from one of their positions to the other (at the other side of the path of the bobbin-frame), so that when the bobbin-frames next come around to the position shown in said Figure 1 and move onward from said position, they leave the notches of the disks 7 in which they were formerly retained and proceed in the corresponding notches of the adjacent disks 7, as already stated.

"In defendants' machine the bobbin-frame is provided at its inner end with a somewhat broad flange projecting from all sides of the axis of the bobbin-frame, said flange or base-plate being adapted to enter, for a part of its length the flat space between the notched disk on the hollow shaft and the adjacent gear of said shaft. By this means the bobbin-frame is held up at its outer end. The flange or base-plate of the bobbin-frame is also provided on its bottom face with two substantially parallel curved grooves, into one or the other of which passes a pin or tongue or stud which stands out from the gear. On the opposite side of the flange of the bobbin-frame are two shoulders (in this particular case represented as the inner end of notches or curved grooves), the surface of the flanges leading to these shoulders being beveled or inclined. These inclined surfaces and shoulders engage with spring-pressed pins mounted in the notched plate and projecting inwardly towards the adjacent gear or pinion. The bobbin-frame is held to the gear and notched plate by the insertion (in the operation of the machine) of the flange on the bobbin-frame between said gear and notched plate in such manner that the stud or tongue enters the groove on the bottom or rear face of the bobbin-frame flange, while the spring-pin rides up the incline on the outer face of said flange until it drops over the shoulder referred to. The

spring-pin holds the bobbin-frame in place against removal in one direction, but permits it to move in the opposite direction. Whenever a bobbin-frame comes between two adjacent spindles, said bobbin-frames will be equally inserted in each of said adjacent twisters, and it can be transferred from that to which it has previously been attached in one twisting operation to the next twister for another such operation by reversing the movement of the crank. In other words, when the bobbin-frames are in line with the spindles and all the spring-pins have engaged with the shoulders in the bobbin-frame bases, the said bobbin-frames may be transferred to adjacent twisters by reversing the direction of rotation of the hand crank.

"A difference between the exact construction shown in the Conner patent and that present in defendants' machine is apparent in that, in the machine of the Conner patent, the rotation of the gears and twisters may continue in the same direction, while in defendants' machine the automatic switching or transferring action is accomplished only by the reversal of the motion of the hand-crank. I do not think that this difference relieves defendants' machine from subjection to the claims sued on in the Conner patent, because in both cases the same general object is effected and the same advantage obtained. That is to say, sliding-frames for shifting the sections are dispensed with in the structure, and the labor of operating such shifting frames is dispensed with in the manipulation of the machine. In both cases the operator has nothing to deal with but the crank, and while it is true he deals with the crank in the Conner construction by giving it continuous rotation in one direction, and in defendants' machine by reversing the direction of motion at intervals, the shifting is nevertheless equally automatic in both cases and the employment and operation of a previously used contrivance is dispensed with.

"I notice that the concluding words of each of the claims say that the bobbin-frames are 'withdrawn from the notches of those disks having similar rotation and lodged in the notches of the oppositely revolving disks.' I understand this to mean, first, a recognition of the fact that in the machine having its gears directly intermeshed with each other, alternate twisters revolve in opposite directions, no matter which way either of them may revolve. This is equally true of defendants' machine and the machine of the Conner patent. It is a fact, however, that when the direction of motion is reversed in either machine those disks which before revolved in one direction now revolve in the other, and it follows that in defendants' machine the bobbin-frames are transferred from the disks or twisters which

formerly revolved in the same direction that is now given to the disks or twisters to which the bobbins are transferred. If this precise construction were had in mind by Conner, he would, possibly, by the terms quoted, have arbitrarily cut defendants' machine out from under the claims; but it is evident that he merely intended to say that the bobbin-frame is transferred to the next adjacent twister which may otherwise be described as one having an opposite direction of motion.

"Wherefore, in my judgment, and notwithstanding the formal differences which I have pointed out between defendants' machine and the Conner illustrated construction, said defendants' machine embodies the invention of automatic transfer of the bobbin-frames set forth in said Conner patent and specified in claims 2 and 3 thereof."

Mr. See, referring to the distinction that defendants' expert seeks to draw between the Conner patent and defendants' machine, says (*R., p.* 239):

"Regarding the Conner patent: Mr. Wiles, as with the Kitselman patent, appears to found most of his distinctions upon a misapprehension of the machines of the prior art. For instance, he refers to the Nesmith and Winsor machines. But it seems that the more they are studied the further we are led from machines of the class in controversy. Mr. Wiles considers that Conner has taken the Kitselman machine and substituted therein the transfer mechanism of Winsor. I have heretofore reviewed this matter in answering a previous question, and neither Conner nor defendant have adopted or could employ the Winsor transfer mechanism.

"Mr. Wiles thinks defendants' machines distinguished from the Conner claims because Conner involves switches and defendants' machine has 'no switching or shifting mechanism whatever.' Mr. Wiles has, I fear, failed to understand defendants' machine. It has switches and will not operate without switches. These switches are carried by the gears themselves. Notice in the face of each of defendants' gears a pair of round buttons. These are the heads of reciprocating spring switch pins. Operate the machine or the models to produce the transfer of side sections and notice that at each transfer the appropriate switch pins move out and then snap in. At the instant of intended transfer hold the proper switch pin outward and prevent its retraction, and the transfer will not take place ,these switch pins being essential to the operation. Remove these switch pins and no transfers could be effected. De-

fendants' machine has switches, and switches are essential to its operation.

"Mr. Wiles appears to think the notches in the disks in defendants' machine are without office and, in support of this view, he has produced the model called the mutilated model, with some of the disks cut away as chords of a circle so as to remove the notches from those disks, the model appearing to work all right in the absence of the notches in those disks. But it is to be observed that in the mutilated model the hubs of the side sections still find a bearing on the chords of the disks, and within the rear of these mutilated disks there are side-engaging elements taking hold of the side sections so that they are properly held and carried by the central sections. And it is to be also observed that in the mutilated model the disks at the outer ends of the side sections still retain their notches engaging at the outer end of the central section or spindle, the side sections thus getting support from the notched system. And, aside from all this, the conditions of strain in use are absent. When defendants' machine is at work there are heavy inward strains brought upon the side sections of the twisters, strains which must be met, and which if not met would interfere with the practical operation of the machine. I am of the opinion that defendants' machine, if constructed like the mutilated model, would present fatal embarrassments when being used under practical conditions. The machine is somewhat troublesome as it is, as can be judged by operating either it or one of the little models. Everything may be moving along nicely and the proper transfers seem to be taking place when all of a sudden, owing to some little inadvertent manipulation, a transfer miscarries and one or more side sections fall out of the machine to the floor or the ground. Indeed, the tyro will need to have his wits about him to keep these side sections in the machine. In defendants' machines which I have lately seen there has been added to the upright a vertical notched member extending up and down along outside the series of reel carriers and obviously intended to prevent this exasperating dropping out of the side sections. Defendants' machine would appear to be a Davisson-Kitselman machine embodying the system of Conner whereby switches direct the transfer and whereby the transfers, under the direction of the switches, are effected entirely by the rotation of the twisters, the path of transfer in defendants' machine being the same as the path of transfer in the Conner patent."

See, also, dep. Dayton (*R.*, *pp.* 295-302, *A.* 7).

Mr. Dayton also points out the advantages of the orbital movement common to the Conner construction and the defendants', and secured by means of the invention embraced in these claims, as follows (*p.* 307, *A.* 9):

"It will be recalled that in the Davisson patent the transfer of the mesh wire spool-carriers is made from one spindle to another when the spool is directly between and in line with the adjacent spindles, and also that such transfer is made by a bodily movement away from one of the spindles and toward the other. It follows that the spool-carrier must be smaller than the distance between the spindles. In the Conner construction, on the other hand, the orbital circles around the two adjacent spindles coincide or touch at the point directly between the spindles and the transfer of the spool from one spindle to another or from one orbit to the next involves no bodily lateral movement of the spool-carrier away from one spindle and towards the other in a line between them, and it consequently follows that the spool, with its carrier, may be made of a size practically filling the space between the two spindles.

"The advantage of this construction in a wire fencing or wire netting machine is obviously that the mesh wire spool, being made larger than was possible in the Davisson construction, holds more mesh wire and requires, therefore, to be less frequently removed, refilled and replaced.

"Defendants' machine corresponds with the Davisson and the Conner patents in making the transfer of the spool from one twister to the next when the spool is in line between the two adjacent spindles, and it corresponds with the Conner construction and differs from the Davisson in that it contains the Conner improvement upon Davisson whereby the bodily movement of the spool away from one spindle and toward the other in a straight line between them is obviated, or, in other words, in making the orbits of the axes of the spool-carriers coincident with the pitch lines of the gears or to touch at a point in the straight line of the two adjacent spindles and employing switches, sending them directly from one orbit to the other. Defendants' machine has, therefore, the advantage afforded by Conner's improvement of allowing the larger spools for the mesh wires to be employed, by which time and labor are saved in recharging them."

When defendants entered upon their infringing enterprise they

procured the services of the patentee Conner (who had before assigned his patent to complainants) in making patterns for and starting the construction of the infringing machine. (*Dep. John E. Frederick, R., p. 27, A. 61-70; dep. Kitselman, p. 92, A. 27-33; dep. Ward, p. 107, A. 40-51.*)

Infringement—Pope Patent.

Defendants have closely copied the improvements embraced in the claims of this patent here in controversy (the 1st, 9th and 10th). The spindle in front of the driving gear is made stationary, and the cross-head journalled on it so as to be rotated with the rotation of the gears. A solid stationary support is thus afforded to the warp wire at the front end where its sag has to be resisted. The friction between it and its support is eliminated. The vertically aligned series of twisted gears loosely journaled on the stationary tubes are provided with the parallel face grooves, and the shiftable spool-carriers have tongues registering with the grooves in these wheels, while shifting devices are provided for sliding the groove-carriers from one wheel to the other. The outer collars which support the shifting sections are placed at their bases or inner ends, dispensing with forward bearings. Each element of each claim is supplied in substantially the same relationship, performing the same office, and securing the same advantage, as in the patent.

After explaining the Pope patent in language which has been before cited under the title of "Pope Invention," Mr. Dayton, referring to the claims in controversy, thus explains the correspondence of defendants' machine with each of them (*R., p. 51*):

> "In this understanding of these claims, I regard defendants' machine as clearly falling within them all. Defendants' machine has the upright frame piece provided with 'a series of regularly spaced openings;' it has the 'stationary [non-rotatable], elongated warp wire tubes' or spindles 'fitted at one end in said opening' in the frame; it has the 'vertically aligned series of intergeared twister wheels loosely journalled on said stationary tubes' or spindles. It does not literally have grooves in the face or actual front surface of the twister wheel, but it has spaces answering in kind to the under cut portion of the grooves shown in the drawings of the Pope patent, and the shiftable spool-carriers have base flanges, each answering to the T-shaped flange M of the Pope spool-carrier, which enter

these recesses in the twister wheels so as to give support to the spool from its basic and direct attachment to the twister wheel, as in the Pope patent. Moreover, the spool-carriers of defendants' machine '*slide*' 'from one wheel to the other,' which is the form of movement expressed in the claim and performed in the Pope device. Defendants' machine also has 'shifting devices for sliding the spool-carrier from one wheel to the other,' said 'shifting devices' having certain features of novelty in details of construction, but embodying the general automatic principle of the Conner patent, as hereinbefore explained.

"Notwithstanding the recognized differences in construction between defendants' machine and that shown in the Pope patent, said defendants' machine embodies the broad ideas and features invented by Pope and consisting in the non-rotative hollow spindles and in the support of the spool-frame directly upon the gear wheels, by entering and sliding engagement which permits the transfer of the spool from one wheel to the other, esentially as Pope provides. Hence defendants' machine, in my opinion, falls under claim 1 of the Pope patent, if the latter be given such fair interpretation as it seems to me entitled to receive.

"Defendants' machine clearly, fully and easily complies with the terms and spirit of claim 9, which reads as readily and appropriately to said machine as it does to the form of the invention illustrated by Pope in his patent. Defendants' machine also conforms to claim 10, the side-wise projecting base flange on defendants' spool-carrier frame answering essentially to the flange or T-shaped tongue on the base of Pope's spool-frame, the recess to receive this flange answering to the corresponding recess of the Pope twister-wheel and the movement for engagement and disengagement of the parts being in both cases a sliding one in the plane of the twister wheels. Hence, in my opinion, the defendants' machine contains the subject-matter of all three of the enumerated claims of the Pope patent, to wit, numbers 1, 9, and 10."

Mr. See, after reviewing the prior art as affecting this patent, in light of the criticisms and distinctions insisted upon by defendants' expert, says (*p.* 235):

"Defendants' machine has the series of non-rotary hollow spindles projecting rigidly forward from the upright and supported by rigid engagement of their heels with the upright; and on these spindles are loosely mounted the intermembering spur gears forming the transmitting train of the machine and form-

ing the central portions of the twisters; and the cross-heads or reel drivers and carriers of the system are formed directly on the faces of these gears; and the reel carriers are of outstretching, overhanging disposition, mounted directly in front of these gears and directly connected therewith by having their heels separably engaging the fronts of the gears so as to permit of the shifting of the reels from one gear to another. Defendants' machine therefore appears to embody improvements superposed by Pope upon the Davisson-Kitselman machine."

Again, referring more specifically to the several distinctions urged by defendants' expert, Mr. See says (*p.* 240):

"Mr. Wiles appears to consider straight sliding transfer as essential in considering the Pope claims and also considers the specific tongue-and-groove arrangement of Pope as essential. I do not so look upon the matter. So far as sliding is concerned its object is merely to transfer a woof reel from one twister to another, and precisely the same result in this respect is arrived at whether the transverse movement of the side sections be in straight lines, as in Davisson, Kitselman, and Pope, or in sinusoidal line, as in Conner and defendant. So far as the specific tongue-and-groove connection between the reel carriers and the gears is concerned, the only object is to provide for temporary union between the gears and the reel carriers so that the gears may for the time being turn the reel carriers in their orbits, the temporary character of the union permitting the reel carriers to be associated first with one and then with another twister. The object after all is to have a rotary cross-head and outstretching reel carriers temporarily united to and driven thereby and shiftable therefrom. The tongue-and-groove of Pope has receiving and retaining qualities. The receiving quality lies in the fact that the gear has a recess and the reel carrier has a projecting feature adapted to dispose itself within such recess. The retaining quality is due to the fact that the projecting member of the reel carrier, in engaging the recess of the gear, finds position behind a wall of the recess, so as to prevent frontal displacement, the reel carriers thus being united to the gears by heel engagement only. And in defendants' machine the reel carriers are united to the gears by heel engagement only, and they have projections engaging recesses in the gears, and these projections, in entering the recesses engage behind the walls of the recesses so as to prevent frontal displacement. Defendants' machine unquestionably presents the conditions of outstretching spindles fixed by their heels against rotation in

the upright of the machine; gears engaging with each other and loosely running on the rear portions of these stationary hollow spindles; recesses formed at the front of the gears; reel carriers disposed in front of the gears and carrying woof reels; projections on the heels of these reel carriers and disposed within the recesses in the gears; projections of these entering members engaging behind walls of the recesses in the gears; the prevention of frontal displacement of the reel carriers; the temporary union between reel carriers and gears; and transfer devices for effecting transposition of the reel carriers."

See, also, upon the same subject, dep. Dayton (*pp.* 303-307).

Law Governing Infringement.

While it is true that to constitute an infringement, every element specified in the claim must be present or represented by an equivalent which serves its purpose, it is equally true that changes in the structure of the elements which do not deprive them of their capacity to perform their office do not avoid infringement, notwithstanding these changes may greatly alter their appearance or add distinct advantages. Improvements in the individual elements, or in the mechanism by which they are operated, or in other parts of the machine, may be the subject of valid patents, but afford no justification for using the invention on which such improvements are incorporated. Patents for new machines, as well as for pioneer improvements in old machines, are generally stated in the terms of a "combination," this being a convenient method of designating the essential features of the invention. The use of this term does not (as the circuit court seems to assume) lessen the patentee's right to protection against any changes which retain the essential features of the elements claimed, whether with or without improvements, or against the substitution of equivalents. Most of the cases where the broadest doctrine of equivalents has been applied have related to claims expressed in the terms of a "combination," and the patents were entitled as for "improvements" in machines of the art to which they belonged.

The primary rule is that the claims of the patent are, if consistent with their terms, to be construed so as to protect the patentee in the substance of his invention, and a defendant who has appropriated the invention by disguising it under changes of form, or by substituting equivalents for some of its elements, cannot escape liability by reason of such disguises, nor can the patent be limited or defeated by showing how earlier machines, built and operated upon a

different plan, might have been converted into the machine of the patent, especially so where such conversion involves a rejection of the plan of construction and operation inherent in such old machines and the adoption of a distinct plan borrowed from the complainants' patent.

The Davisson and Kitselman inventions were more radical in their departure from the prior art, and in the practical result original with them, than most of the patents which the courts have treated as "pioneer" patents and accorded the broad doctrine of equivalents recognized as belonging to such patents. But it requires in the present case no exceptional liberality of construction to subject the defendants' machine to the claims here relied upon. To many of these claims it corresponds literally as well as substantially; as to the remainder, the modifications made are unmistakable equivalents for the purposes of the patents, or mere supplemental improvements which do not escape infringement.

In *Consolidated Valve Co.* v. *Crosby Valve Co.*, 113 U. S., 157, the improvement covered by the patent in suit consisted in a modification of an old valve. It required but slight mechanical change to convert the old apparatus into that of the patent. The claim was for a combination stated quite specifically, not only designating elements by literal reference and by terms descriptive of their shape, but adding the words "constructed in the manner, or substantially in the manner, shown," etc. The defendants' construction did not correspond to the terms of the claim, while valves introduced from the prior art, though lacking the peculiar function which the court found to be performed by this combination, responded quite closely to the language of the claims if read without reference to the office actually performed in the patented combination. The supreme court, reversing the court below, held the patent to be valid and infringed, distinguishing it from the prior art by the substantial difference in effect produced (though the defendants were able to show that by slight modifications, which they contended were merely mechanical, the prior valves could be made to produce the same effect), and that it was entitled to a construction which disregarded the literalisms of the claim and covered defendants' device, embodying the same principle, though the elements of the combination were very different in construction. The same device was held to infringe both patents sued on, one being for an improvement on the other. Defendants' device thus held to infringe was the subject of two patents owned by defendant. This decision is well summarized by Justice Blatchford (who had delivered it) in *Morley Machine Co.* v. *Lancaster*, 129 U. S., 263, where, in applying a doctrine of equivalents to a mechanical patent broad enough to include the sub-

stitution of entirely different elements which served the same purpose in the combination, the court said (*p.* 276):

"The same doctrine was applied by this court in *Consolidated Valve Co.* v. *Crosby Valve Co.*, 113 U. S., 157, to the Richardson patent, the claim of which was, 'A safety valve with the circular or annular flange or lip *c c*, constructed in the manner, or substantially in the manner, shown so as to operate as and for the purpose herein described.' It appeared that Richardson was the first person who made a safety valve which, while it automatically relieved the pressure of steam in the boiler, did not, in effecting that result, reduce the pressure to such an extent as to make the use of the relieving apparatus practically impossible, because of the expenditure of time and fuel necessary to bring up the steam again to the proper working standard; and that his valve was the first which had a strictured orifice leading from the huddling chamber to the open air, to retard the escape of the steam, and to enable the valve to open with increasing power against the action of the spring, and to close suddenly with small loss of pressure in the boiler. It was held that that claim covered a valve in which were combined an initial area, an additional area, a huddling chamber beneath the additional area, and a strictured orifice such as that above mentioned, the orifice being proportioned to the strength of the spring. It was also held, that, under the claim of the second patent, viz.: 'The combination of the surface beyond the seat of the safety-valve, with the means herein described for regulating or adjusting the area of the passage for the escape of steam, substantially as and for the purpose described,' the patentee was entitled to cover the combination, with the surface of the huddling chamber and the strictured orifice, of a screw-ring to be moved up or down to obstruct such orifice more or less, in the manner described. It was further held that both of the patents were infringed by a valve which produced the same effects in operation by the means described in Richardson's claims, although the valve proper was an annulus, and the extended surface was a disk, inside of the annulus, the Richardson valve proper being a disk, and the extended surface an annulus surrounding the disk; and, although the valve proper of the defendant had two ground joints, and only the steam which passed through one of them passed through the stricture, while, in the Richardson valve, all the steam which passed into the air passed through the stricture; and, although in the defendant's valve the huddling chamber was at the center, instead of at the circumference, and was in

the seat of the valve, under the head, instead of in the head, and the stricture was at the circumference of the seat of the valve, instead of being at the circumference of the head. These conclusions were based on the fact, stated in the opinion of the court, that no prior structure was known or recognized as producing any such result as that produced by Richardson's apparatus; that the prior structures never effected any kind of result attained by his apparatus, because they lacked the thing which gives success; and that, taught by Richardson and by the use of his apparatus, it was not difficult for skilled mechanics to take the prior structures and so arrange and use them as to produce more or less of the beneficial results first made known by him.

"The doctrine thus applicable to a machine patent is of a kindred character with that applied, in this country and in England, to a patent for a process."

In this case of *Morley* v. *Lancaster*, 129 U. S., 263, the court reversed the decision below, which had found that there was no infringement because of great differences between the elements used.

The patent was entitled "for an improvement in machines for sewing buttons on fabrics." Its claims were for "combinations." The defendants' machine was patented.

After explaining that the devices which had been substituted for those of the patent had not been used for the same purpose before, and mentioning as illustrations of equivalents that (*p.* 289):

"In the Lancaster machine, the brush for rolling over the buttons is the obvious equivalent of the corrugated plate in the Morley machine."

And that (*pp.* 289 *and* 290):

"In the Lancaster machine the action resulting from the twisted way is a mechanical equivalent for the button-wheel, the punch, and the carrier used in the Morley machine to turn the eye into the proper plane for the needle to enter it."

And that in each of the machines (*p.* 290):

"A spring-gate is employed, opened in the one case by an active device, while in the other case an active device moves the conveyor away from the particular button which is being held by the needle."

The court says (*p.* 290):

> "In this sense the mechanical devices used by the defendant are known substitutes or equivalents for those employed in the Morley machine to effect the same result; and this is the proper meaning of the term 'known equivalent,' in reference to a pioneer machine such as that of Morley. Otherwise, a difference in the particular devices used to accomplish a particular result in such a machine would always enable a defendant to escape the charge of infringement, provided such devices were new with the defendant in such a machine, because, as no machine for accomplishing the result existed before that of the plaintiff, the particular device alleged to avoid infringement could not have existed or been known in such a machine prior to the plaintiff's invention."

See, also:

Royer v. *Schultz Belting Co.*, 135, U. S., 319.
Ives v. *Hamilton*, 92 U. S., 426.
Blake v. *Robertson*, 94 U. S., 728.
Cochrane v. *Deener*, 94 U. S., 780.
Machine Co. v. *Murphy*, 97 U. S., 120.
Sessions v. *Romadka*, 145 U. S., 29.

In *Hoyt* v. *Horne*, 145 U. S., 302, the claim in controversy was as follows (*p.* 304):

> "The improvement in beating rags to pulp in a rag-engine having a beater-roll and bed-plate knives, consisting in circulating the fibrous material and liquid in vertical planes, drawing the same between the knives at the bottom of the vat, carrying it around and over the roll and delivering it into the upper section of the vat, substantially as described."

The defendant's machine had no means for "circulating the fibrous material and liquid in vertical planes" or for "delivering it into the upper section of the vat," and its changes from the construction shown in the patent added materially to the efficiency of the machine. The supreme court said (*p.* 308):

> "The main question in the case is that of infringement. In the defendant's engine the beater-roll is also located at the end of the tub and extends across its entire width; the top of the back-fall or dam also extends across the entire width in

front of the beater-roll, but narrows at one side as it descends to the bottom of the tub to one-half of its width. The mid-feather is made vertical instead of horizontal, so that the pulp after it leaves the dam circulates in a horizontal instead of a vertical plane; but as it returns to the beater-roll it passes back under the dam, spreading out to the entire width of the tub, and is taken up by the beater-roll precisely as in the Hoyt patent. It is insisted by the defendant in this connection that there is no infringement of the first claim of the Hoyt patent, since the pulp is not circulated 'in vertical planes,' nor is it delivered by the beater-roll 'into the upper section of the vat,' as specified in that claim. Literally it is not. A technical reading of the specification undoubtedly required that the mid-feather should run horizontally instead of vertically; but the object of this was that the pulp should be received and delivered by the beater-roll along its entire length, viz.: across the entire width of the tub, and this is accomplished in the same way in both devices. In both engines the beater-roll revolves towards the top of the dam or back-fall, and a similar acceleration of speed is obtained. How the pulp shall circulate at the other end of the tub is a matter of small consequence so long as it shall circulate in vertical planes at the point where it comes in contact with the roll.

"An additional function is claimed for the Horne device in the fact that the pulp, falling as it descends the dam from a vertical to a horizontal plane in a kind of torsional current, is more thoroughly mixed than in the Hoyt device, where the pulp continues to flow in parallel lines from the time it is delivered by the beater-roll to the time it is received by it again. This may be true, and defendant's engine may be in this particular an improvement upon the other; but he has none the less succeeded in appropriating all that was of value in the Hoyt device, viz.: the beater-roll at the end of the tub, extending across its entire width, and the circulation of the pulp in vertical planes at the only point where such circulation is of value. The substitution of a vertical for a horizontal mid-feather at the inoperative end of the tub is merely the use of of an old and well-known mechanical equivalent, and obviously intended to evade the wording of the claims of the Hoyt patent. *Winans* v. *Denmead*, 15 How., 330. Indeed, the ingenuity displayed in this evasion is only equalled by the ingenuity with which it is concealed in the specification of the defendant's patent, and the function of a more thorough mix-

ture of the pulp put forward as the salient feature of the invention.

. . . . . .

"We are, therefore, of opinion that defendant's machine is an infringement of the first claim of the plaintiff's patent."

In *Westinghouse* v. *Boyden Brake Co.*, 170 U. S., 571, the supreme court reiterates the rule that "where an invention is functional, and the defendant's device differs only in form, or in a rearrangement of the same elements of a combination, he would be adjudged an infringer, even if in certain particulars his device be an improvement on that of the patentee," and concedes that where all the elements of the claim are present or represented by equivalents under other names, infringement is not avoided by changes that may even avoid the terms of the claims. It at the same time applies the equally familiar rule that where one of the elements of a claim is absent and not represented by any device which serves the same purpose as the ommitted elements, there is no infringement notwithstanding the *machine as a whole* may accomplish the same general purpose as the patented machine. It recognizes the fact that whether the substituted elements are equivalents must depend upon whether they perform similar functions in the combination rather than upon their shape or names, but holds that *each element of the combination claimed* must be represented by an element performing a similar office in the combination, and that if one or more of the elements named is not so represented the claim is not infringed merely because the machine, by a combination of essentially different elements, accomplishes the same result. This distinction has been repeatedly applied and restated by the supreme court during the last half century.

In *Clough* v. *Barker* (106 U. S., 166) the claim of the Clough patent in suit was expressed in terms of a combination, and with the usual conclusion, "substantially as described." The defendant's structure was made under a later Barker patent, which contained improvements that departed from the terms of the complainant's claim. The supreme court, in finding the patent in suit valid and infringed, recognized the fact that the improvements in the elements of the claim were of a patentable nature, they having dispensed with certain parts and reduced the cost of construction and introduced an improved result. In speaking of the infringement, the court said of the valve arrangement of the defendant's that it

"must be held to have been an equivalent for that of Clough to the full extent to which that of Clough goes, involving, per-

haps, patentable improvements, but still tributary or subject to the patent of Clough."

It simultaneously, in the case of *Clough* v. *Mfg. Co.*, 106 U. S., 178 (a countersuit on the Barker patent under which the defendant in the former case was manufacturing), found that this Barker patent was valid, referring to the fact that it dispensed with the interior tubular valve of Clough and was made in two pieces instead of three; that it was less expensive to make, and in regulating the supply the shell alone revolved and the frame always remained in one position; that is to say, while it finds the valvular arrangement of the Barker patent the mechanical equivalent of that in the Clough combination, so far as that combination goes, and therefore the Barker device an infringement of the Clough patent, it, at the same time, holds that this Barker valvular arrangement is, in itself, a new and useful improvement originating with Barker, and the subject of a valid patent to him.

See, also, *Blake* v. *Robertson*, 94 U. S., 728; *Hoyt* v. *Horne*, 145 U. S., 302; *McCormick Harvesting Machine Co.* v. *Aultman, Miller & Co.*, 37 U. S. App., 299 (69 Fed. Rep., 371).

In *Keystone Mfg. Co.* v. *Adams*, 151 U. S., 139, where the patent was for a comparatively slight invention, the court held that the differences in construction and operation of defendants' machine did not escape infringement. The differences were such that in one case the feed-teeth (the principal element of the combination) brought the corn directly to the shelling devices, while, in the other, the corn dropped by gravity down a chute to a point where they passed into the throat of the sheller.

See, also:

Dubois v. *Kirk*, 158 U. S., 58.
Hobbs v. *Beach*, 180 U. S., 383.
Busch v. *Jones*, 184 U. S., 598.

There is hardly a case in all the authorities where the question of infringement has been seriously discussed, in which the devices substituted by the defendant did not have peculiarities that distinguished them from the devices named in the claims of the patent. By "known equivalent" the authorities do not mean solely a device which, in its peculiarities of structure, was known at the time, but include any which possesses a character known to be an equivalent for the character of the element for which it was substituted, or which performs a similar office in the patented combination.

See Robinson on Patents, Vol. I, Sec. 248.

The patent under which defendants claim license (Whitney No. 552,025), instead of indicating (as contended by defendants) that the patent office regarded defendants' construction as lacking the in-

vention covered by the claims here in controversy, carries a strong implication that the office regarded these elements as substantially the same as those of the Kitselman patent, for no claim is allowed in this Whitney patent covering the elements which correspond to the subject-matter of these Kitselman claims, all the Whitney claims being in terms limited to one or more specific added or supplemental features. This Whitney patent purports to be for an improvement upon the shifting mechanism of an existing machine. The first ten claims are limited in terms to a certain specified *latch* device, in combination with the other elements, which are inferentially conceded to be old apart from this latch device. The eleventh claim is limited to what are termed "automatic transferring devices" in connection with other specified elements. The twelfth and thirteenth relate to a clamp and lever by which the machine is gripped to the longitudinal wire, and have no relation to either the twisting or shifting mechanism. Appellees' citations, therefore, have no pertinence, or rather the patent under which defendants claim carries a strong implication that the patent office treated Whitney as a mere improver upon Kitselman, entitled to claim only certain specified devices which he had added to the combinations embraced in the claims here in suit, and treated his sectional twister as corresponding part by part to the Kitselman and offering no basis for a patent even as improvements thereon.

Patents can usually be obtained for improvements upon a patented machine by claiming the elements which are taken from the prior patent in combination with some added elment or some specific improvement thereon. This carries with it no implication that the device thus claimed does not contain the invention covered by the prior patent, or that it would not infringe the prior patent if used without license thereunder. The question upon which the patent office has to pass in allowing a patent for such an improvement is not whether it infringes the prior patent, but whether the specific addition or improvement is new. If it is new, it can be claimed in connection with the elements of the old device, and the allowance of such claim does not imply that either the patentee or the patent office regarded this addition or improvement as avoiding the prior patent.

Clough v. *Barker*, 106 U. S., 166, read in connection with *Clough* v. *Mfg. Co.*, 106 U. S., 178 (more particularly referred to before), conclusively establishes the proposition that the substitution, for elements of a combination claim, of subsequently patented improvements which serve the same purpose in that combination, does not escape such claim, even though the improvements are themselves the subject of valid patents and are composed of a different number of parts, some of them endowed with additional capacity, and hav-

ing material advantages over the elements for which they have been substituted.

See, also, *Wilcox & Gibbs Sewing Machine Co.* v. *Merrow Machine Co.*, 93 Fed. Rep., 206 (circuit court of appeals, second circuit).

Every patent for a new machine which goes into extensive use is followed by subordinate patents for improvements thereon which usually claim those improvements in connection with elements of the original machine. Such subordinate patents do not confer upon the patentee any right to use the original machine upon which the improvements are incorporated, or any feature which has been borrowed from the original machine. They simply confer the right upon the subordinate patentee to *exclude others from using what he has added.*

In substantially all the cases cited under the present title the defendant's machine found to infringe was made under patents owned or controlled by the defendant, and in many of these cases the court recognized defendant's patent as adding materially to the value of the machine. These subordinate patents, in many cases, embrace the combinations held to infringe, and greatly improve them. Such was the case in, among others, *Hobbs* v. *Beach*, 180 U. S., 383 (398); *DuBois* v. *Kirk*, 158 U. S., 58 (63); *Cons. Valve Co.* v. *Crosby Valve Co.*, 113 U. S., 157 (167); *Morley* v. *Lancaster*, 129 U. S., 263 (265); *Royer* v. *Schultz Belting Co.*, 135 U. S., 319 (see 28 Fed. Rep., 851); *Blake* v. *Robertson*, 94 U. S., 728 (733); *Cochrane* v. *Deener*, 94 U. S., 780 (782); *Hoyt* v. *Horn*, 145 U. S., 302 (309); *Machine Co.* v. *Murphy*, 97 U. S., 120; *Clough* v. *Barker*, 106 U. S., 166; *Keystone Mfg. Co.* v. *Adams*, 151 U. S., 139 (145); *McCormick Harvesting Machine Co.* v. *Aultman, Miller & Co.*, 69 Fed. Rep., 371 (386); *Crown Cork & Seal Co.* v. *Aluminum Stopper Co.*, 108 Fed. Rep., 845.

Circuit Court Opinion.

The distinctions upon which the circuit court rested its finding relate to features not mentioned in the claims sued upon, or to changes which do not deprive the elments included in these claims of their respective functions in the combination or of their mutual co-operation for the purposes set forth in the patent. It laid much stress upon differences in respect to features which are the subject of other claims of the patents in suit, not charged to be infringed here, and to which it was plainly not the intent of the patentee or the patent office to limit the claims in suit.

The court apparently misunderstoood the purport of what was

said in behalf of complainants about the Davisson invention, supplemented by the Kitselman, having made it practicable to weave a wire mesh fench *in situ*, and confused it with a claim for making a machine portable, not distinguishing between a claim to mechanism by which conditions incompatible with field use were eliminated and a claim for a *portable* machine as such. I have, under a prior title, endeavored to make plain that the stress laid on the merit of the inventions in avoiding the necessity for the complex and cumbrous mechanism upon which prior schemes for weaving wire fence were dependent, and upon the fact that they, for the first time, made it possible to bring such a machine within the conditions of practical field use, was not to be confounded with a claim for a portable machine or for providing means of locomotion. There is a vital difference between claiming a combination of elements, one of the advantages of which is that it has contributed to a certain useful result, and claiming that *result* without reference to these elements. But, in judging the scope and merit of any combination, the result accomplished must be considered. Complainants are not claiming to cover the application of means of locomotion to a wire-twisting machine, but directing attention to the fact that the inventions covered by the claims in suit created the first mechanism for meshing wire which was capable of adaptation to field use, and produced the first machine capable of making such fence *in situ*. No preceding machine, even if provided with the same means of advancing it along the course where the fence was to be placed, would be capable of practical use there, because of the fundamental differences in the operative mechanism of the machine. There is nothing in the files that controverts this or impairs its significance for the purposes for which it has been referred to.

The validity of the Whitney patent is a question entirely distinct from the question whether defendants' machine contains the invention covered by certain claims of the Davisson patent. The Whitney patent may be valid, though it contain some or all of the inventions of the Davisson, and it may be invalid if it contain none of them. The grant of the Whitney patent does not indicate any opinion of the patent office that the machine exhibited in it would not infringe prior patents; for it was bound to grant the patent, whether it would or would not infringe prior patents, if it contained an additional invention, either an improvement on the same mechanism or supplemental features. A patent cannot be used to suppress an *independent* invention, merely because the machine, as a whole, accomplishes the same object, where it does not accomplish it by a combination of similar or equivalent elements; and what is an

equivalent must depend upon the function of the individual element; but when the same result is accomplished by a combination of equivalent elements, there is an infringement, notwithstanding the elements are changed in form or additional functions given by improvements in their construction or by improvements in adjacent mechanism. This is plainly shown by cases heretofore cited, and has been more particularly referred to under "Law Governing Infringement," *ante*.

The spindles of the Davisson patent and of the defendants' machine are alike *stationary* in the respect which alone is material, so far as the purposes of that patent are concerned, viz., their axes are stationary so that they maintain the warp-wires in a fixed alignment, while the woof-wires are carried around them and to either side of them by the movement of the spools. The claims of the Davisson patent are not concerned with the question whether the central spindles or tubes do or do not rotate on their fixed axes. Their performance of the office assigned them in that patent does not depend upon whether the entire central member rotates or only so much of it as is necessary to impart the desired revolution to the spool carriers. If the rotation of the cross-head around the spindle, as a journal bearing, instead of on it as a stud bearing, introduces an additional advantage, it may sustain a patent for an improvement on the former construction, but it substracts nothing from the capacity of the combination to perform the office given it in the Davisson patent, and therefore does not escape infringement. This improvement did not originate with defendants, having already been introduced into complainants' machine, being a feature of one of the later patents in suit; but it would make no difference so far as infringement of the Davisson patent was concerned, if it had originated with defendants and been patented by them. An improvement gives no right to the thing improved upon. Nor is the end-wise movement of the spindles an element of either of the claims in suit. It is an element in the first claim of the patent, which, therefore, is not charged to be infringed. Its omission from the second and third claims plainly means that they are not restricted to it. Defendants' spindles are arranged in line and mounted in bearings on a suitable supporting frame. They are hollow and have cross-heads on each spindle, carrying the reels for wires on opposite sides of the spindles, serving the exact purpose of the patent and corresponding to the terms and substance of the claims. Whether defendants' cross-heads are nearer to or farther from the supporting frame than illustrated in the Davisson patent does not alter their character or function, and is utterly immaterial, so far as the question of infringement of this patent is concerned. Nor can

these claims be avoided by such an ordinary mechanical alternative as journaling the cross-heads on the spindle so that they rotate on it as a journal, instead of connecting them rigidly to it and rotating it upon its bearings. In either case, the axes of the spindles are the center around which the cross-heads revolve for exactly the same purpose and with the same effect. There is no restriction in the claims which distinguishes between these two familiar methods of rotation. Nor is the specific means of transferring the spools from one cross-head to another an element of either of the claims in suit. It is an element of other claims, which, therefore, are not included in the charge of infringement. The exact transfer from one cross-head to the other required by the patent is effected so that the co-operation of the elements recited in the claims is retained, and this is all that is necessary. The omission from these claims of any limitations to specific transfer mechanism, when other claims contained such limitations, and when it is obvious that the same co-operation can be effected through a variety of transfer mechanism which makes the same transfer at the same interval, means that it was not intended to confine these claims to the particular mechanism shown and described. It was necessary for the patentee to illustrate some transfer mechanism adequate to accomplish the purpose, but he was not obliged to limit every claim in the patent to that particular instrumentality for making the transfer. So long as the spools are transferred from cross-head to cross-head at the required time, and all the elements mentioned in the claims are present and co-operate for the purposes of the patent, the claims can not be avoided by making the travel from one destination to the other in a curved path instead of on a straight line, or by variations in other details not mentioned in the claims nor depriving the specified elements of their office in the combination. In the defendants' machine, as in the Davisson patent, the transfer of the entire series takes place at the same instant and in response to the actuation of a single shifting agent—the hand-lever, which, in defendants' machine, is in the form of a crank. Nor is it material that the cross-heads of defendants' machines are not interchangeable with complainants' without a corresponding change in the adjacent or co-operating parts of the machine. It hardly ever happens that such interchange is possible between the elements made exactly as shown in the patent and those made to evade it in an infringing machine. If infringement could be avoided by so constructing the corresponding elements that they would not be interchangeable with those of a machine made in exact conformity to the drawings of the patent, no patent could be given any substantial protection, for it is easy for any intentional infringer

to reproduce the invention under such changes of form as would render interchange of elements impossible. This can be done while servilely copying the entire substance of the machine, element by element, by giving to each element or to adjacent parts with which it must engage, such mechanical modifications as exclude interchange of part for part. In few, if any, of the cases where infringements have been found by the courts have the infringing elements been of such shape and proportions as to be interchangeable with those of the patent without corresponding changes in associated elements.

In dealing with the Kitselman patent the circuit court dwells upon differences in respect to features not relevant to the claims in suit, many of them the subject of other claims, which for that reason are not charged to be infringed. If every claim is to be limited to every feature illustrated in the machine, whether mentioned in such claim or not, claims would be useless, for the omission of anything shown or mentioned in the drawing or specification would evade a patent, and the more comprehensive the invention the more impossible it would be to protect it. The object of having a series of claims is to cover certain features by certain claims and other features by other claims, and where an element is mentioned in one claim and not in another, the implication is that claims which do not mention the element are not to be limited specifically to that element.

The claims of the Kitselman patent charged to be infringed are those which are not limited to the particular shifting mechanism. There are other claims which are limited to that mechanism, and are not included in the charge of infringement. The elements named in the claims in suit are present in the defendants' machine (with only such changes of form as do not deprive them of their essential character), co-operating to perform the same office, and that office is not changed by the fact that the spool-carriers take a circuitous instead of a direct path in traveling from one twister to the other. In each case the parts must be in registration when the transfer takes place, and the spool-carriers are transferred simultaneously, by a vertical movement, from the twister above to the twister below, or *vice versa*, for the same purpose and with the same effect. In each case a single movement of the lever-arm (which in defendants' is a crank-arm) shifts one of the side sections or spool-carriers of each twister so as to bring it in conjunction with the complemental side section or spool-carrier which has before been rotating as a member of the twisters above or below it. In each case enough of the central section revolves to perform the office of the cross-head and impart rotation to the side sections. In each case the rotation is on the same axis, and

the claims are not concerned with the question whether the spindle rotates with the cross-head or serves as a journal on which the cross-head rotates. In each case the same gear applies the same rotation of the central section around the same axis in the same relation to each of the parts, for the same purpose as in the Kitselman patent. In each case the shifting of the spool-carriers is effected by a hand lever though in one case that hand lever has the form of a crank and in the other a different form. There is nothing in the claims that requires the spool-carriers to be supported either at both ends or at one end only. As a matter of fact, they are supported in each case at both ends. In neither case are the spool-carriers taken out and turned end for end, nor are the claims in any way concerned with a capacity for doing so. In each case the hollow spindles are made stationary in the sense required by the Kitselman patent (that is, maintained in fixed relative position in alignment with each other and on the same axial center, while the other members of the twister are shifted). In neither case would the capacity of the hollow spindles be destroyed by leaving the tubular portion stationary. In each case it is equally necessary to rotate enough of the central portion to impart the necessary movement to the adjacent side sections. In each case the segmental ends of the side sections of the twister make, with the lateral end pieces of the central sections, wheels at the ends of the twisters which rest in supports which permit their rotation; in each the engagement and mutual support of the three sections is at both ends, and in each the purpose and effect is the same, though the defendants have disguised the wheels at the outer end by changing the shape, while carefully preserving their office. In neither case can the spool-carriers be transferred, except when the parts have been brought to a position of rest in a fixed alignment and the movement of the pinions arrested. There are differences in the mechanical devices for effecting the transfer which are the subject of later patents sued upon, but with these differences in the shifting mechanism the Kitselman claims in suit are not concerned. Precisely what has been said of interchangeability in referring to the Davisson patent is applicable here. Defendants' machines are constructed on the plan of the Kitselman patent, so far as the subject-matter of these claims is concerned. Differences in the shifting mechanism which may be the subject of other claims, but which are not inconsistent with the performance of the subject-matter of these claims, do not control this question of infringement, whatever may be their effect upon the validity of subsequent patents relating thereto.

It is true that in the Conner construction the crank is turned in one direction while defendants reverse it at intervals when the shift-

ing is desired, but in neither can the shifting take place except at intervals when the parts are in exact registration. What I have said about the rotation of the wheel spindles in referring to the Davisson and Kitselman patents is equally applicable here. Defendants' spool-carriers are supported at both ends equally with those of the Conner and Kitselman patents. In each case the spool-carriers are carried around by the central section or cross-head, and any differences in the notches by which those parts engage with each other are not material to anything referred to in the claims, or to the question of infringement. In each case the spool-carriers and disks are, and must be, so interlocked with each other as to prevent them from flying at a tangent while being carried around. There is no material difference in this respect between the Conner and the defendants'. The claims of the Conner patent are not concerned with the question whether the transfer is effected by turning the lever constantly in one direction or by reversing the direction of rotation, nor is it material whether the spool-carriers pass first to the same side of the opposite spindle as that which they occupied at the time of the transfers and thence to the opposite side or first to the opposite side and thence to the same side, providing (as is the case with each) their engaging sides are brought and maintained in the same relation with each member of that twister as they had with the several members of that twister with which they were before associated. While the switches of defendants' machine are not literally "pivoted," they are none the less switches, serving the same purpose in the combination, and the claims are not limtied to the pivoting of the switches. The spring-pressed pins automatically engage with the spool-carriers of defendants' machine at certain fixed intervals in such manner as to enable the shifting to be effected at such intervals by the proper movement of the lever; but they can be drawn out of engagement by turning the lever in one direction, or made effective for the purpose of shifting by turning it in the other direction. The claims in suit are not limited to the use of the parallel bars or to the specific details of switch construction. In the defendants' machine the crank-lever is a "common means, acting simultaneously upon all" the switches to effect the shifting. In each case the spool-carriers come into position where they can be transferred at will from one twister to the other, though, as illustrated in the Conner, the intervals of transfer are determined by the setting of the machine, in the first instance, to fix a uniform interval of transfer, and a forward movement of the lever at that interval will effect the transfer, while in the defendants' there is also a fixed interval, but the transfer can be avoided or effected at either of these intervals by an appropriate movement of the lever. In each case they are incapable of transfer

until the parts come into a particular registration. In each case the spool-carriers are transferred into the notches of an oppositely rotating pair of disks. Defendants reverse the direction of rotation of the *entire machine* after each transfer. But it is none the less true that the bobbin-frames or spool-carriers are lodged in the notches of adjacent oppositely revolving disks. Those from which they pass always revolve *contemporaneously* in opposite directions from those to which they pass, and this is the material thing. It makes no difference that after the transfer the entire machine is reversed, for it is still true that the twister to which each spool-carrier has been transferred always turns in the opposite direction to that from which it was transferred, nor is it material whether the switches are attached to the disks and engage with the adjacent part or are attached to the adjacent part and engage with the disks. This is a mere reversal of parts, equally within the claims.

The circuit court could hardly dispute the fact that the defendants' machine corresponds to the terms of the claims of the Pope patent, or that the corresponding elements co-operate together for the same purpose and with the same effect, but it lays stress on the fact that whereas the engaging tongues and grooves in the one case are shown as T-shaped, in the other they are not T-shaped. That the interlocking tongue and grooves are there, engaging in the same way and for the same purpose, is manifest. Whether the tongue is precisely T-shaped, or some other shape that will take into the groove and guide the corresponding surfaces in the same way as the T-shape, is quite immaterial. The claim is not limited to "T-shaped" tongues. Nor is it material whether the tongue is on the wheel face and the groove on the opposite face, or the parts reversed. Such reversal does not even escape the literalisms of the claim, and does not alter the effect. Of course, if the outlines of the engaging surfaces of the respective parts are not identical in proportion as well as in every other respect, with those shown in the drawing of the Pope patent, the parts cannot be interchanged; but, as has before been said, this is almost invariably true of any infringing device. The engaging surfaces have precisely the same function in shifting the spool-carriers in one case as in the other. Nor is it material that in passing from twister to twister the spool-carriers in one instance have a direct path and in the other a curved path. The object and effect of the transfer is the same, and the destinations reached are the same. Nor are the specific differences in the construction of the shifting mechanism material to these claims. Nor is it true that in the defendants' machine each spool-carrier is transferred separately or independently. There, as in the complainants', the movement of the same lever handle (the crank-arm) imparts

simultaneously movement to all of them, and this transfer can only take place when they are all in the proper registration.

The usual cunning of intentional plagiarists has been resorted to by defendants in copying under such changes of form as may impose on those who cannot distinguish between appearance and substance, but they have carefully retained the same elements co-operating in substantially the same way to the same end.

CANADIAN DECISION.

Defendants have put in evidence a copy of an opinion of a Canadian judge in the case of *Risdon* v. *Cochrane* (*p.* 117). This was a suit on a patent taken out by Kitselman in Canada and *assigned to Risdon*, the plaintiff in that suit. Neither of the parties to the present suit were privy to that. The defendants' machine was not the same as that involved in the present litigation. The patent sued on was one existing under a different law, and the opinion of the court, if it correctly represents the law as administered in Canada, shows conclusively that that law is completely at variance with the law of this country, as construed by our supreme court.

The suit being between strangers, and upon a totally different record, the decision, of course, can have no effect here except as instructive upon the law, and whether it is entitled to any weight in this respect must depend upon whether it appears to be in harmony with, or to proceed upon a different understanding of the law from, the controlling decisions in this country. This opinion does not touch upon the question whether the defendant's machine contained the subject-matter of either of the claims of the patent in suit, but proceeds upon the assumption that if the machine which that plaintiff was building under this patent differed from defendant's in any of its parts (whether in frame work or in shape or in the strength or thickness or size of the working parts), or if the defendant had introduced into his machine any improvements over the plaintiff's machine as built, or had "rearranged" the machine, or if the defendant's machine was of a better mechanical construction, or if the defendant's machine was constructed with fewer parts (not in respect to the elements embraced in the several claims, but in respect to the frame work or actuating parts or other incidents of the machine), there could be no infringement. The court assumed that the question was whether the defendant had a valid patent, and, if so, that was conclusive against infringement; that if the defendant's machine, as constructed, was in any respect better than the patented machine, as constructed by the plaintiff, that was fatal to the charge of infringement. It dwells upon the difference in the construction

of the frame; the difference in the mechanical means of attaching the spools; the fact that the central shaft of defendant's machine "had three bearings, so that it was stronger and thicker than in the plaintiff's machine;" that the wire passing through the central shaft "goes through a thicker tube than in the plaintiff's;" that in the construction of the machine as a whole the defendant has used fewer parts than the plaintiff; that "there is a greater weight in the defendant's machine and, therefore, a greater strength;" that the defendant's machine, having the same number of spools, "a fence four inches higher can be made," and, from such premises arriving at the conclusion that "the defendant's patent is a good patent," treats that as precluding infringement. There is nowhere reference to the claims of the patent or the terms of the patent, or any effort to distinguish the elements upon which the claims are predicated from structural features of the machine upon which they are in no wise dependent —no reference to the *invention* embodied in the patent, as distinguished from such mechanical details in the construction of complainant's and defendant's machine as those above mentioned. Apparently the court understood that the comparison was to be, not between the defendant's machine and the claims of the patent in suit, but between the entire mechanical construction used by the plaintiff (including quality of workmanship, strength of parts, etc.), and the entire mechanical construction used by defendant, assuming, further, that if defendant's machine was in any respect a better machine, or contained any supplemental improvements, that was conclusive against infringement. The opinion throughout is in direct conflict with the controlling decisions in this country. The question of infringement under our law does not depend upon whether the plaintiff builds a better or a worse machine than the defendant, or whether the defendant has or has not improved the machine either in its mechanical construction or by supplemental invention. It would be found that, in most of the cases in which defendants have been adjudged infringers of mechanical patents, defendant's machine has contained a different number of parts than the complainant's and that they have differed in respect to strength and excellence, in respect to convenience of handling and economy of operation; that the parts of the defendant's machine could not be interchanged with the parts of the complainant's without materially altering their shape and proportions; and that there has been a "readjustment" of parts, frequently with the result (as expressed by the Canadian court), "that it altogether is more seemly looking." In most of the important litigations where mechanical patents habe been held infringed, the defendant's machines have been made under later patents embodying important improvements

which, in turn, were recognized as patentable; but this has not been treated as a defense against the charge of infringement. This proposition and the decisions pertinent to it, have been more specifically referred to under the title "Law Governing Infringement," *ante*. Cases there cited, such as *Clough* v. *Barker*, 106 U. S., 166; *Cons. Valve Co.* v. *Crosby Valve Co.*, 113 U. S., 157; *Hoyt* v. *Horne*, 145 U. S., 302; *McCormick* v. *Aultman, Miller & Co.*, 37 U. S. App., 299, and many others, are conclusive against the doctrine of the Canadian court. They clearly hold that improvements even where patentable, are no defense against the charge of infringement.

It is one of the advantages of most valuable inventions (especially those which strike out in somewhat new lines) that they lead to subsequent improvements upon the same machine. The subsequent improver is not the less entitled to his patent for his improvement because it is subordinate to the principal patent so long as that patent remains in force, but the grant of the patent to him does not lessen his liability as an infringer of the patent upon which he improves, if, during the term of that patent, he makes, uses or sells the improved machine without obtaining license under it.

NOVELTY AND SCOPE OF COMPLAINANTS' PATENTS.

Novelty—Davisson Patent.

It is seldom that a single invention or patent makes such a radical departure from everything preceding it, abolishing at a single stroke such a complication of mechanism, and introducing such simplicity and economy of operation, as did the Davisson invention embraced in the claims in suit. There is nothing in the prior art embodying any similar plan of operation, or indicating the possibility of weaving wire fence (whether as a fabric made in the shop or as a fence woven along the posts in the position which it is to occupy in the field) by any means which excludes the rear twist, or dispenses with the complication of mechanism required to deal with that twist. The prior machines referred to by defendants' expert as exhibiting the closest approaches in the prior art, show most conclusively that their authors had no conception of the possibility of accomplishing this object by any means approximating, or in any respect analogous to, the Davisson.

Defendants expert, when asked in cross-examination to name the prior exhibit which he regarded as "most nearly or completely embodying the invention recited in the second and third claims" of

the Davisson patent, answers: "The Nesmith patent, No. 10,743." (*R., p.* 172, *X-Q.* 14.)

To support the argument which he bases on that patent, he introduced a model designated as "Defendants' Exhibit Nesmith Model," not a model corresponding to the patent or to any part of the patent, but a model constructed by defendants since this suit was commenced and with complainants' patents as a guide, with the evident design of converting the feed mechanism (not the twisting mechanism) of the Nesmith machine into something which, when brought into a different relationship from that which it occupied in the Nesmith machine, and having imposed upon it a function utterly unlike any which it performed, or could perform, in that machine, might be plausibly confused with the Davisson invention. Care was taken, *first,* to omit from this model all that part of the Nesmith machine by which the twisting of the wire into mesh was effected; *second,* to remove the feeding mechanism from its relation to other mechanisms which excluded it from applying any twist to the wires and confined its operation to preventing twist in them; *third,* to incorporate into it features which were not shown or described in the Nesmith patent, and which are inconsistent with what is shown and described there; *fourth,* to alter parts of the machine which are shown and described and which excluded the operations which, for the defendants' purpose, it was desirable to incorporate into this model, thereby giving to the model a theoretical capacity which it did not have in the Nesmith patent; *fifth,* to ascribe to the model thus reconstructed a capacity dependent upon its being brought into direct co-operation with suitable mechanism for applying a counter twist immediately in front of the gear illustrated in this model, and for drawing the wire through these gears when thus held in opposition to their rotation —a plan absolutely irreconcilable with the Nesmith patent. While these changes, governed by a plan borrowed not from the Nesmith patent but from complainants', made of defendants' Nesmith model a machine fundamentally unlike anything shown or described in the Nesmith patent, they are not sufficient to bridge the chasm between the Nesmith and the Davisson machine, for though the constructors of the model have not hesitated to make changes which alter the functions of the parts, they have felt the necessity of retaining some visual resemblance to such parts of the feeding mechanism of the Nesmith patent as were unmistakably shown and described in that patent, and they could not introduce the elements of the Davisson claims without abandoning all resemblance to any part of the Nesmith patent.

Complainants have obtained from the patent office a certified copy of the Nesmith model, which is in evidence as "Complainants' Exhibit Nesmith Certified Model," which, in every part shown in it,

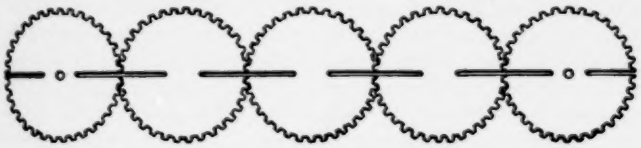
corresponds substantially to the drawings of the patent, except that the shaft with its coupling, projecting backward from the feed end of the machine, appears to have been put in wrong end to, in the model. (*Dep. See, R., p.* 243, *A.* 11.) While every element in this certified model is shown in the drawings of the patent, the model but imperfectly represents the complications of the machine, for many parts are missing from it, probably destroyed at the time of the Patent Office fire in 1876. The certificates show the model to comprise all that remains of the original model. The parts that are present in this model as well as in the drawings of the patent not only fail to show any such construction as that of defendants' model, but exclude such construction. There are parts shown in the certified model, as well as in the drawings of the patent, that are irreconcilable with such construction as that of defendants' model, and other parts whose existence would have no explanation if the plan of construction and operation had corresponded to defendants' model. I refer more particularly to this subject hereafter, citing evidence touching the departures made in defendants' model; but this will be better understood after a comparison of the Davisson patent with the Nesmith and other prior patents cited by defendants' expert. This is explained and illustrated by Mr. Dayton as follows (*R. p.* 265, *A.* 4):

> "I do not find disclosed, suggested or described in any exhibit of the prior art, the subject-matter of the second or of the third claim of the Davisson patent nor anything substantially equivalent thereto; and I also do not find in any of said exhibits anything which, in my opinion, tends to limit or qualify those claims, nor which modifies the opinion I have heretofore expressed concerning the substantial correspondence of defendants' machine with the subject-matter of those claims. On the other hand, the comparison of the Davisson patent with the prior art brings out into bolder relief the distinctive novelty of the Davisson invention and makes more clear the substantial identity of defendants' machine with that of the Davisson patent with respect to the subject-matter of the second and third claims referred to.
>
> "Giving my reasons for these conclusions, I first point to the fact that the prior art in machines for weaving wire netting discloses, broadly, but a single kind of twisting device, namely, a rotating disk provided with passages through it for the wires to be twisted. There were two forms of this rotating disk twister, one in which the disk is integral and has opposite radial slots extending inward from the margin of the disk toward its center, and the other in which the disk is diametrically divided and each

half is provided with a hole for the wire at some distance from the center. These disks were provided with peripheral cogs or gear teeth, and, in the case of the slotted gears, said gears were intermeshed with each other, while in the case of the divided gears said gears were not intermeshed with each other, but were engaged with longitudinally reciprocatory racks. The divided gears were also combined with devices by which the half gears could be shifted in the direction of their diametrical divisions (brought into line with each other) so as to pair each half gear alternately with either of the two adjacent half gears on the opposite side of the division line.

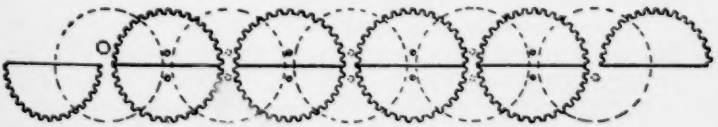
Dayton's Sketch of Prior Twisters.
No. 1. – Slotted-Gear wheels. – wheels intermeshed.

(e.g. Nesmith – Sedgwick)
End gears with or without central holes.



No. 2.
Half Gear wheels – halves shiftable, one, from one fellow-half to next and back.

(e.g. Whitehead – Combs)



"I here introduce, to be made a part of my deposition, a sketch illustrating these two forms of disk twister known in the art prior to the Davisson patent. The sketch is entitled 'Dayton's Sketch of Prior Twisters.' Form No. 1 shows the gear wheels radially slotted as above described, as for example shown in the Nesmith patent and the Sedgwick patents,

and Form No. 2 shows the divided twisting gears shown in the Whitehead British provisional specification which is prior in date to the Davisson patent in suit, and also in the Combs United States patent which shortly followed in date the Davisson patent in suit.

" In the use of these disk twisters of the older art all the wires entering into the fabric proceeded *from behind the disks* or gears from suitable spools, reels or cops. It is, therefore, obvious that in the absence of means for preventing the result, the rotation of the twister gears to twist the wires in front of them would also twist the said wires behind them. This objectionable action was prevented by one or another form of device for carrying at least one of the supply spools around the other one engaged in feeding to the same twist, and this feeding mechanism became known distinctively as the feeder part or ' feeder ' of the machine. The ' feeder ' of such netting machines was therefore contrived to perform the function of an anti-twister or anti-tangler in such machines. Any one who has seen a lady braid her hair and observed how she draws her fingers through the long unbraided portion of her hair as the braiding proceeds, or who has ever in his youth braided a whip lash and been compelled to continually run his fingers through the strands from the braid to their free ends in order to prevent their becoming entangled with each other, will clearly appreciate the necessity of an anti-twister or anti-tangler in one of these old wire netting machines employing the slotted or divided gear twisters above referred to and shown.

" Such was the character of prior netting machines at the date of the Davisson invention. The exhibits, Nesmith and Sedgwick patents, employed the slotted gear wheels above designated as Form No. 1 and the Whitehead exhibit illustrates the divided gears above designated as Form No. 2.

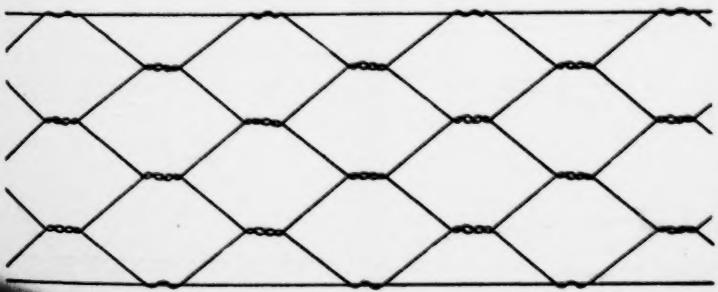
" Concerning these machines of the prior art it should be further metioned that sometimes provision was made for the introduction into the fabric of special, heavier, marginal wires to form the straight edges of the fabric and sometimes no special wires were introduced for this purpose, the straight edges being formed of one of the wires entering into the marginal twists. Special marginal wires being usually heavier than the mesh wires, to facilitate their introduction and avoid their deflection in the operation of the machine, central holes for their passage were made in the end disks or gears of the slotted twisters shown above as form No. 1. So far as the prior art shows, or

so far as I am aware, special marginal wires passing through the center of rotation of the twisters were confined to those machines employing the radially slotted twisters, as, for example, in the Nesmith and Sedgwick patents. A vague and unintelligible proposal to introduce such special marginal wires is made in the brief and unillustrated provisional specification of the Smith British patent exhibit, but there is nothing in the prior art which shows or tells how this could be done in connection with the divided gears (say, of the Whitehead provisional specification), and the fact remains that machines in the art prior to Davisson in suit, adapted for the introduction of marginal wires through the axes of the marginal twister gears, were confined to that form of machine employing the integral radially slotted gear twisters of the above illustrated Form No. 1.

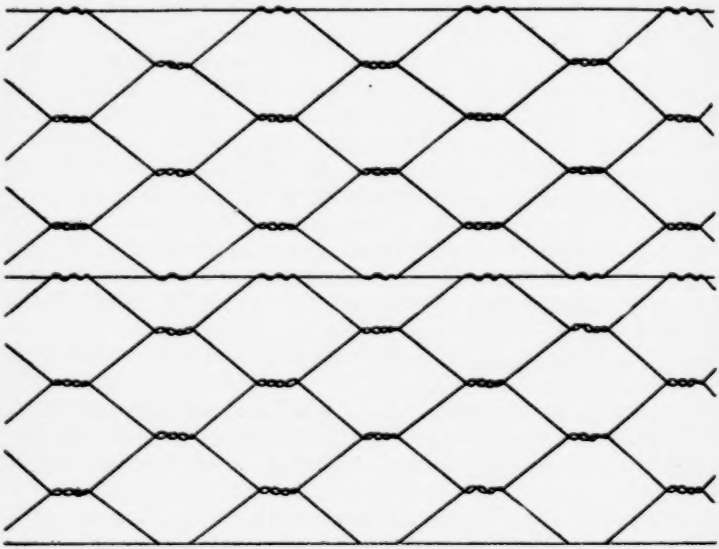
'The Sedgwick patents (differing from each other in details of the feeder mechanism and other minor matters, but corresponding with respect to their use of the slotted gear twisters) propose the introduction of straight tension wires into the fabric between its margins and in addition to the special straight marginal wires. But by reason of Sedgwick's adherence to the older slotted-gear twister and to the accompanying arrangement of all the supply spools in a feeder mechanism back of the gear twisters, he was unable to simultaneously twist two mesh wires upon any such intermediate tension wire, and the result was that his machine could produce only what my colleague, Mr. See, has happily termed a 'twin netting,' or, in other words, two essentially separate nettings united to a common marginal wire. In other words, the two mesh wires on opposite sides of any such intermediate tension wire made on a

Dayton's Sketch of Prior Fabrics.

No. 1 (Nesmith)

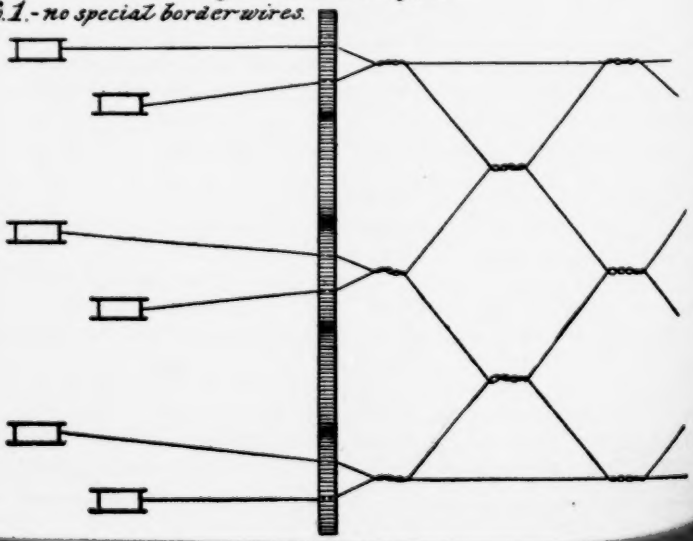


No. 2. (Sedgwick.)

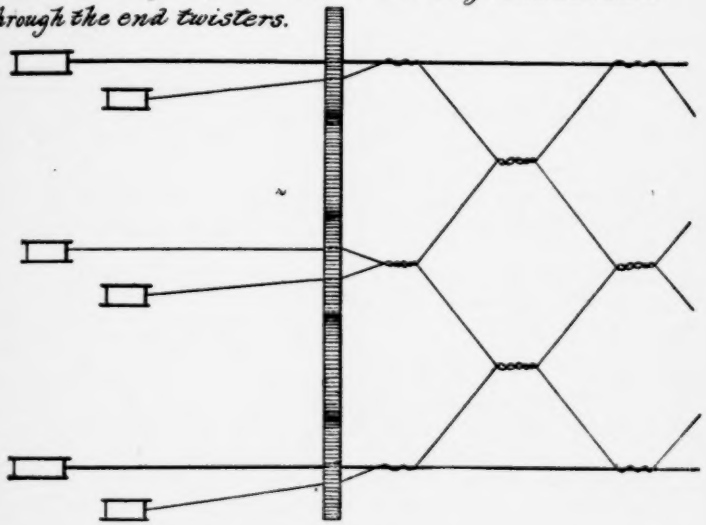


Daytons Sketch of Prior Machines.
(Slotted-gear-twister Type)

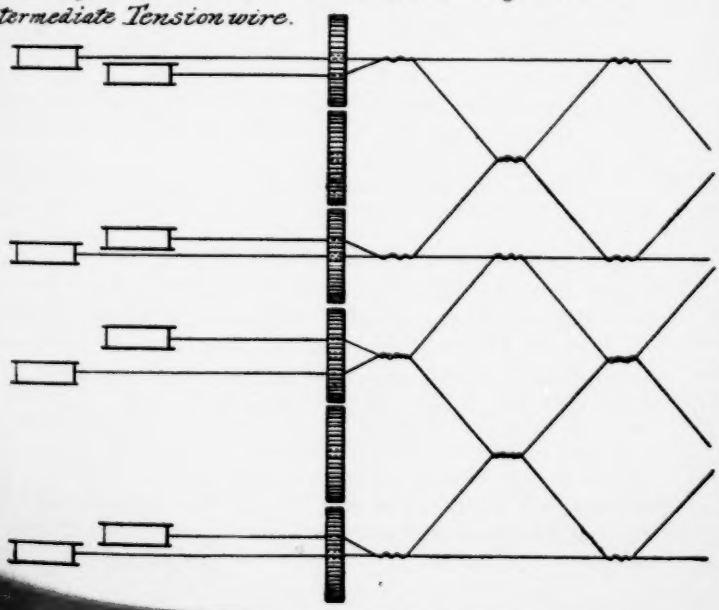
No. 1. - no special border wires.



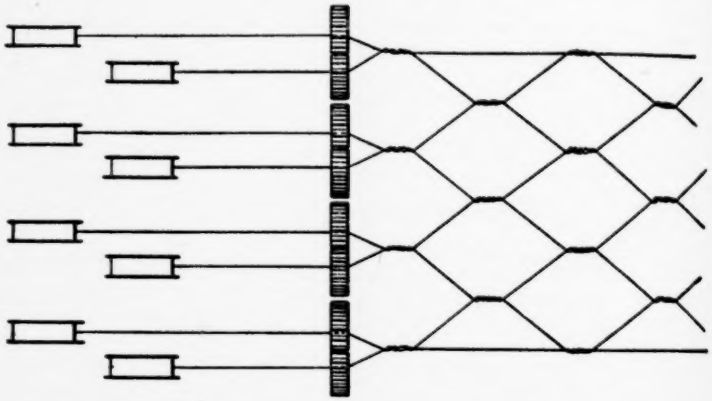
No. 2 - provision for special border wires by central holes through the end twisters.



No. 3. - Sedgwick Slotted Gear Machine, working with an intermediate Tension wire.



Prior Machines of Divided-Gear Type.



Sedgwick machine did not converge and unite with the intermediate tension wire at the same points, but at different points, alternating with each other throughout the length of the fabric.

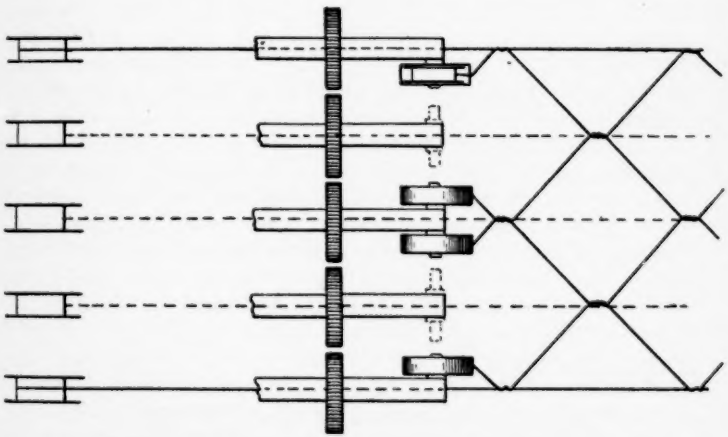
"I here introduce as part of my deposition a sketch giving two illustrations showing the fabric possible to be made prior to the Davisson patent. The Sketch is entitled 'Dayton's Sketch of Prior Fabrics.' Illustration No. 1 represents the fabric made by the Nesmith machine and, of course capable of being made by the Sedgwick machine, which illustration No. 2 shows the 'twin netting' also possible by the Sedgwick machines.

"To conclude this general description of prior machines for making wire netting, I here introduce as part of my deposition further illustrations, in general plan view and in the nature of diagrams, showing machines of the art prior to the Davisson patent here in suit. The sketch is entitled 'Dayton's Sketch of Prior Machines.' Figure 1 shows machines employing slotted-gear twisters without special provision for heavy marginal wires; Figure No. 2 illustrates the same type of machine with heavy marginal wires passing through the centers of the end twisters; Figure No. 3 shows the special Sedgwick machine with an intermediate tension wire and threaded in the only way in which it can be operated when such intermediate tension wire is introduced and Figure 4 illustrates the essentials of the old machines employing the divided form of twister gears.

"It will be observed that in all these illustrations of machines, faithfully taken, as to their essentials, from the prior patents in evidence, the same disk twisters are employed and the same necessary accompanying arrangement of *all the supply spools back of the twister disks* is preserved.

"In contrast with the prior art as above shown I next introduce into my deposition a diagrammatic illustration of the Davisson invention, entitled 'Dayton's Sketch of Davisson's Invention.' There is here shown, also, a row of gears, *but these gears are not twisters.* They are neither slotted nor divided

Dayton's Sketch of Davisson Invention.



1st. The Gears are neither slotted nor divided.
2nd. The Gears are not "twisters" but mere spool-revolvers.
3rd. The Mesh-wire spools are here (for the first time) made twisters.
(a) In making the mesh-wire spool-twisters, they are (for the first time) put in front of gears, and adjacent to the points where the twists are made.
(b) This leaves only tension-wire spools back of the gears and abolishes all former complications growing out of the presence of the mesh-wire spools back of the gear twisters.

and perforated, to give passage to the mesh wires. Indeed, *the mesh wires do not pass through these gears.* On the other hand the spools which supply the mesh or woof wires, instead of being placed behind the gears whence their wires would need to pass through said gears, are placed in front of the gears and adjacent to the points where the wires pass from them into the twists of the fabric. In this new position the mesh wire spools of the Davisson machine have also a *new function.* In the old art, they merely supplied wire which was twisted by the twister-gears. In this new position given them by Davisson they not only supply the mesh wire, but they become vital agents in the twisting operation. *They are the twisters.* The gears of the Davisson machine are merely to revolve these spools in order that, in their new position, said spools may do the twisting. Hence, as the mesh-wire *spools* in the Davisson machine have taken on a new function, so the *gears* of the Davisson machine have surrendered an old function, the former twisting function of the gears being now, in Davisson, transferred to the mesh-wire spools in their new position and relation.

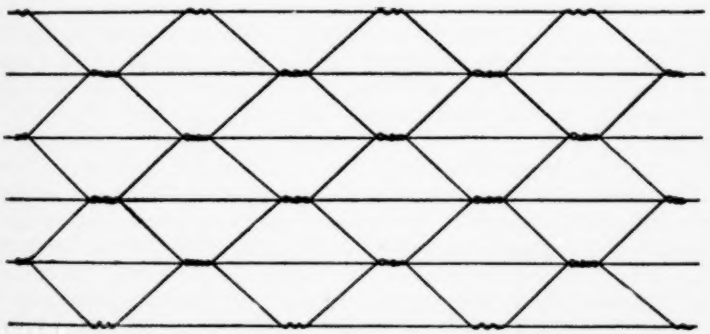
"So much for changes made by Davisson in old parts. It will next be observed that Davisson has introduced wholly new parts, to-wit, the spindles AA. These spindles have no existence anywhere in the prior art in question. Said spindles in Davisson's invention are in the axes of the gears, and are made hollow to permit the passage through them of tension wires leading from tension wire spools still retained back of the gears. These wholly new spindles form definite supports for the tension wires passing through them and, in the precise construction illustrated by Davisson, form the medium through which the gears revolve the twisting spools which supply the mesh wires. In other words, in the precise construction shown by Davisson the hollow spindles are rotatively rigid with the gears and the mesh-wire spools are conveniently attached to the spindles instead of to the gears themselves by which, however, said spools are revolved as stated.

"All the spindles AA being hollow, or as many of them, additional to the marginal ones, as may be desired, being made hollow, not only may a fabric having two special marginal tension wires be made of any desired width, but, quite unlike the Sedgwick machine longitudinal tension wires may be inserted through all or any number of the meshes of the fabric and through the twists where the mesh wires are twisted together. The Davisson machine is therefore capable of producing a form

of wire netting fabric such as was producible by no machine of the prior art and such as is nowhere shown to have an existence prior to Davisson's invention. And this particular fabric turns out to be the principal product produced in the manufacture of wire fencing at the present time being stronger, more rigid and more durable, I believe, than any other form of netting or fencing in which the same weight of wire can or has been disposed. I refer to the form of fabric next below illustrated and also shown in Figs. 10 and 11 of the Kitselman patent in suit, but not shown in the drawings of the Davisson patent. This cut

Dayton's Sketch of New Fabric. Capable of being made by the Davisson machine.

Taken from Fig's 10 and 11 of Kitselman's Patent



which I here introduce is marked 'Dayton's Sketch of new fabric, capable of being made by the Davisson machine.' Indeed it is not clear that Davisson at the time of taking his patent had thought of this form of fencing or had discovered that his machine would make it. This is the fence to which Mr. Wiles, defendants' expert, evidently has reference in his answer to Q. 4, where he mistakenly says that the machine of the Nesmith patent and the machines of the two Sedgwick patents could make it, and that the said Sedgwick patents 'describe the fabric made by the machine of the respective patents, as having edge wires and intermediate tension wires, if the latter be needed.' What the Sedgwick patents could make in the nature of fabric having an intermediate tension wire is shown in illustration No. 2 of my preceding sketch of 'Prior Fabrics.'

"The capability of the Davisson machine to produce this particular fabric results from the provision, first made in the art by him, for revolving two mesh wire spools simultaneously around the same intermediate tension wire, in connection with the provision of holes through his intermediate spindles for the passage of such tension wire.

"From the foregoing comparison of the Davisson machine or invention with the prior art it seems to me clear that Davisson made a most radical departure from the prior art and that his invention, in view of its radical differences from the prior art and of its results in making a new form of fabric possible and of begetting a new line of inventions (as shown by the improvements thereon set forth in the other patents here in suit, not to mention defendants' machine), is to be fairly regarded as of revolutionary character. This Davisson invention, instead of being restricted to the terms of the claims, is on the other hand, in my judgment, much broader than these terms, and if the terms of the claims in suit were not ample to embrace the structure found in defendants' machine, said claims would, in my opinion, by reason of the pioneer character of the invention, be entitled to such interpretation as would unquestionably include said defendants' machine.

"The claims in suit are, in part, in terms of spindles. In claim 3 the spindles are defined as 'hollow' spindles. These claims evidently might have been more broadly expressed. But defendants' machine has the spindles, and it is no departure from the claim in this particular. Both claims locate the mesh wire spools at the sides of the spindles by the terms, 'having on each spindle a cross-head carrying reels for wire on opposite sides of the axes of said spindle.' Not only were the spindles new in the art with Davisson, but mesh wire spools or 'reels for wire on opposite sides of the axis of said spindle,' and therefore in front of the gears, for revolving the reels, were new with Davisson. And defendants' machine has this feature also. Both claims specify a 'cross-head' on the spindle or carrying the 'reels for wire.' The patent in fact shows on each spindle two cross-heads, either one of which is, to a mechanic, obviously available for 'carrying' these spools or reels around the spindle axis. One cross-head shown in the patent is the gear wheel and the other is the cross bar or pair of arms at the free end of the spindle. It is to the cross-head at the free end of the spindle that Davisson has shown his mesh wire spools attached. Defendant attaches his mesh wire spool to the other cross-head, namely to the gear wheel. In both the Davisson patent and defendants' machine the mesh wire spools are, therefore, revolved about the

axis of the spindle by the same primary means, to-wit, the gears. There is, consequently, no departure in defendants' machine from the Davisson invention as expressed in the two claims in suit.

"Defendants' machine having these essential elements of the Davisson structure and specified in the claims in suit, including the series of hollow spindles arranged in a line, as shown in the Davisson patent, is capable of making and does in fact make the particular fabric above referred to and first producible in the art by the Davisson machine. It is, therefore, the Davisson machine in essentials of structure and in product."

Mr. Dayton then, in aswer to question 5, (*pp.* 273-283) specifies particularly many of the errors into which Mr. Wiles has fallen in his discussion of the prior art and of the Davisson invention, and I make reference to his testimony instead of quoting it at length. He calls attention to the fact that defendants' unauthorized model of the feeding portion of the Nesmith machine (designated "Defendants' Exhibit Nesmith Model"), notwithstanding the license that has been used in supplying it with features foreign to the Nesmith patent, does not contain the elements of the Davisson invention (*see pp.* 275-278). He then specifies some of the unauthorized departures from the Nesmith patent found in the Nesmith model (*p.* 274-283).

Mr. See, after some outline of the prior art, testifies (*p.* 197 *A*, 7) that none of the exhibits prior to the patents in suit is adapted even to the making of such fence as the Davisson and Kitselman inventions provide for, or to the making of netting on the Davisson system of twisting, or adapted at all to the weaving of fence *in situ*. He then explains in detail why this is so with reference to each of the prior exhibits (*pp.* 198-213), calling attention to the fact that what defendants have called the Whitehead patent and the Smith patent, respectively, are not patents, but provisional specifications, which appear to have never been followed up by patents and which do not, in either case, disclose an operative machine or suggest any plan upon which an operative machine could be constructed (*see pp.* 198-203). Then,referring to the Nesmith patent (*pp.* 203-206), and the Sedgwick patents (*pp.* 206-210), he describes their fundamental incompatibility with the Davisson invention, and their incapacity to serve its purpose, explaining the contrast between the method and instrumentalities for intertwisting the mesh in the Davisson patent and those of the preceding patent (*pp.* 210-212). After this explanation, he takes up specifically (*pp.* 213-220) the several patents referred to by defendants' expert as anticipating or limiting the Davisson, making a comparison with each and explaining particularly the fictitious

character of "Defendants' Exhibit Nesmith Model." Some of the departures from the Nesmith patent made in the construction of this model are pointed out (*pp.* 214-216) and also the misleading nature of "Defendants' Exhibit Illustrative Drawing" (*pp.* 216-217). I quote that portion of his answer in which, after the preliminary explanations to which I have referred, he takes up specifically the comparison between the Davisson and the several prior patents. Referring to the *Nesmith* he says (*p.* 213):

> " A mere look at Nesmith's drawing or at the certified model is sufficient to distinguish it away from Davisson. Nesmith has twisters, and reels to the rear of them, and the problem of fatal rear entangling twists. Davisson has no reels at the rear of his twisters, and has no rear, and has solved the problem of rear twists by simple process of cancelling the prime factors. Nesmith starts out by saying 'The principal and main features of novelty of my invention consist in the principle of the revolving of the wires parallel to each other at the same time they are being twisted.' Davisson does not revolve his wires parallel to each other, for he quite abandons that rear region of the machine in which Nesmith seeks this parallelism, or, as Nesmith states: 'They revolve exactly with each other, so as to keep the wires parallel and getting entangled with each other.' Nesmith's machine is composed of a twister to do the work and a feeder of equal dignity to feed the wires to the twister and keep them from rear entanglement, or, as Nesmith states, his machine is 'composed of two parts connected together by two shafts, as seen at P and Q, Fig. 1, and one of said parts I call the "twister," the frame of which is shown at A, A, Fig. 2. The other part I call the "feeder," the frame of which can be seen at D, D, Fig. 2.' Davisson has no dual machine; he has no feeder, or need of one, and he has no such twisting mechanism as Nesmith's which needs a feeder.
>
> "Nesmith has his woof reels to the rear of his twisters, or, stated otherwise, he has his twisters in front of his woof reels. Davisson, on the other hand, has nothing in front of his woof reels, those reels themselves being right in the line of action and virtually constituting the twisters. Nesmith has twisters formed by slotted gears through which the woof wires pass. Davisson has no slotted gears, and the only gears he has are those merely incident to the transmission of the rotary motion essential in the twisting operations. Davisson's twisters being formed by his reels which are in front of the gears which operate them. Nesmith brings his woof wires from the rear forwardly through the slots of his twisting gears, and in making transfers he

needs to move these passing wires from the slot of one gear to the slot of another gear, and this he does by means of wedges entering between the wires. Davisson, on the other hand, does not bring his wires from the rear, and has nothing to do with slots in gears or otherwise, and performs no shifting by directly attacking any wire, but he performs his shifting by transposing the frontally disposed woof reels bodily from one rotating agent to another. Nesmith has perforations or passages through his outer twisters only, and hence cannot put special straight border wires at both edges of a narrow fabric, nor intermediate warp wires in any fabric while Davisson has all of his rotators perforated so as to permit the presence of warp wires at any twist in the series. No twister of Nesmith can deal with more than two wires, a straight border wire and a woof wire at his outer twister; or two woof wires at intermediate twisters, while Davisson's intermediate twisters can all deal with three wires, a straight warp wire and two woof wires.

"I here wish to call attention to a point about the Nesmith certified model. Looking at the face of the twisters, it might, at a hasty glance, be inferred that all were centrally perforated, all looking alike on the face. But only the outer ones are perforated, as will be seen by looking through them or looking at the back hubs of the twisters. The rudimentary perforations seen in the intermediate twisters are merely the counter-sinks employed by the latheman in supporting his work in the lathe while being turned on conical lathe centers. In the partial model produced by defendants, a model showing the feeding devices instead of the twisters, all of the feeding spindles have been perforated, which is contrary to the Nesmith patent. It is to be remembered, also, that the model produced by defendants is the feeding machine only of Nesmith, and not the twisting machine; a part of Nesmith's machine which, instead of being intended for the production of twists, is intended for the prevention of twists. Defendants' model, instead of being the head and front of the Nesmith machine, is the mere tail of it. The production of this tail end model of Nesmith, in connection with Mr. Wiles' remarks regarding it, might be taken as meaning that in view of the teachings of Davisson the tail of Nesmith's machine can be taken in hand and suitably modified, and segregated from the head of Nesmith's machine, and make a better twisting machine than the head plus the tail of the machine as Nesmith had it. But everything that has been done in this direction is directly violative of the law of Ne-

smith's structure. Nesmith took his twisting machine and put his feeding machine to the rear of it in such relationship that the feeding machine could not produce twists, the very purpose of the feeding machine being to carry the wires parallel and prevent the formation of rear twists. In defendants' treatment of the subject it is proposed to disassociate Nesmith's two machines, and discard his twisting machine, and put his feeding machine into some sort of association which will cause it to produce twists instead of prevent twists. It must be remembered that no twisting machine will twist two wires together unless the wires are held against rotation in front of the twisting agent. In Nesmith's feeder the wires come forward from the rotary feeding spindles, so to call them, directly into the twisting spindles rotating in perfect unison with them, thus insuring parallelism and non-twisting of the wires in front of the twisting spindles. In defendants' model the wedges have been slotted so as not to interfere with the passage of warp wires through the intermediate twisting spindles. This is contrary to the Nesmith patent and certified model which has no perforation in the intermediate spindles, and which has solid wedges positively prohibitive of the presence of warp wires in such perforations, if they existed. Again, while Nesmith explains that it is his desire to place at the rear of his twisting machine a feeding machine to carry the wires parallel and prevent rear entanglement, and while he provides that feeding machine with slotted spindles rotating in unison with the twisters, thus guarding against the possibility of entangling twists between the feeding machine and the twisting machine, he does not at all explain how his wires are dealt with within the feeding machine and his drawings are quite vague and unsatisfactory on this point. He explains that his woof wires are on reels, and that these reels are mounted on 'reel stands.' These reel stans are designated by the letter I in his drawings. But there is no description whatever of the manner in which these reel stands are mounted, or how they are supported, or what motions are given to them, or to the woof reels which they carry, and the drawings throw absolutely no light upon the subject. The reel stands are described as 'movable,' but it is not stated what movement they have or how it is produced or whether it means anything more than mere removability. The Nesmith feeding machine may or may not be adequate and operative. But there is nothing in the specification or the drawings on which to found an understanding of adequacy and operativeness or to lead to the positive con-

clusion that the machine has been thoroughly worked out to success. And unfortunately, the certified model has been through the fire and lost its reel stands and reels and whatever moving them. But defendants, in constructing their model, and apparently seeking to produce a certain structure for a certain purpose, have taken considerable liberty and have put in things not found in the Nesmith drawings or justified by the description, and have left out things called for by the drawings and by what is left in the certified model. For instance, as before stated, the Nesmith patent says and shows nothing about how the woof reel stands, I, are mounted or what movements are given to them or how the movements are given. Defendants mount the ends of these reel stands in the slots in the rotary gears of the feeding machine and arrange wedges to shift these reel stands from the slots in one gear to the slots in another gear. There is no authority for this arrangement in the Nesmith patent, for the patent does not state that there is any transposition or any other specified movement of these reel stands. It states that the wedges are to transpose the wires, but does not even intimate that they are to be employed in transposing reel stands or that they have anything to do with the reel stands. Nor do the drawings show that the reel stands are in any way carried in the rotary gears of the feeding machine. And in defendants' model the ends of the reel stands, in order that they may co-operate with the wedges which shift them, which wedges are stated in the patent to be for the purpose of shifting the wires and which the model unfits for attacking the wires by adapting them for use in shifting the reel stands, have been given a diamond form distinctly opposed to what is clearly shown at the ends of the reels stands, the ends in the drawings appearing as flat rectangles. With the unwarranted modification, transpositions and motion qualities which defendants have put into the model it is said that it is Nesmith, and that it is adequate. The model contains things and qualities not found in Nesmith, but it also lacks certain things found in Nesmith. As before stated, the Nesmith drawings are quite vague in all matters pertaining to the mountings and movements, if there are movements, of the reel stands, and the specification is silent on the subject. But in the drawings, on the inner faces of the feeding gears, there are vaguely shown some mechanical details which are not recognizable or in any way determinable from the drawings, and there is no description of the matter. Going to the certified model, it is found that the feeder gears each have a pair of studs project-

ing from their inner faces, these studs being slotted and provided with blade springs flexing across the inner faces of the gears, a few only of these springs remaining in the certified model, broken stubs of some of the remaining springs remaining in their studs. I jugde the model to have closely copied the original model in its damaged condition after the fire. Having seen these studs and springs in the model, it can be recognized that the drawings of the patent were intended to show such construction, but there is no showing or explanation of what these parts are for or what engages them or, in fact, anything about the inner parts of the feeding gears or the ends of the reel stands except that the ends of the reels stands are flat rectangles instead of the diamonds found in defendants' model. And in defendants' model there is nothing of these studs and springs. It would seem that defendants have sought to construct a machine different from, and, perhaps better and perhaps simpler than the Nesmith machine, and finding no use for certain parts at the inner faces of the feeding gears.

"Mr. Wiles has produced a drawing of a further proposed modification of this Nesmith model, the drawing being marked "Defendants' Exhibit Illustrative Drawing." It proposes, as a possible construction, not however represented as being suggested by Nesmith, a pair of parallel bars rigidly uniting the front and rear feeding gears. The purpose of this illustration, as I understand it, is to show that while Nesmith's system of reel stands involves a feeding gear at each end, requiring to be each independently driven, it might be possible to unify the gears by these rigid bars so that one driving apparatus would answer. I don't see what this has to do with the case, for with all the changes that may be rung upon it the Nesmith machine is not a machine on the Davisson system, but, on the contrary, it is an excellent example of the type of dual machines comprising a twister and a rear feeder designed to take care of the fatal rear twists. Davisson cuts loose from the whole scheme. He goes back to the rear feeding part of the compound machine and takes therefrom the woof reels. He takes these woof reels over to the extreme front of the twisting machine. He then goes back and kicks the entire remainder of the feeding machine overboard. He then goes forward to the twisting machine and kicks the slotted twisters overboard. He arranges his woof reel right at the front in the twisting zone where they themselves will do the twisting without any further thought about embarrassing rear conditions. He arranges these frontal reels on heads or carriers extending across the axes of the lines of twist, so arranging the reels that they can he shifted into association with

one cross-head or another. He provides a rotator, exemplified in the form of a spindle with a suitable bearing, for each of these cross-heads. He gears these rotators for rotation in unison by suitable ordinary transmitting gearing exemplified as a system of simple gears engaged by a rack. He pierces the center of all of the rotators so that a warp wire can pass through the orbit of motion of any of the twisting reels. This is what Davisson has done in revolutionizing the twisting system, and I cannot see that he has saved anything from Nesmith except the woof reels, which he has given new location and clothed with new office and endowed with improved capacity. He has thrown away Nesmith's entire feeding machine, saving the woof reels, also the twisters, also the wedges for attacking the wires and shifting them from one twister to another, and he has provided no equivalent device for attacking the wires, for he simply transposes his wires by shifting the woof reels bodily. The Nesmith machine has no single element of the claims of the Davisson patent sued on. Davisson's spindles, as rotators having frontal heads crossing the axes of the rotator to carry frontal twisting reels, are not found in Nesmith, nor is there anything found having any such mode of operation or capacity. The woof reels of Davisson frontally mounted on the heads of the rotators in the twisting zone and having the office of carrying and twisting the woof wires, are not found in Nesmith. Having a machine constructed according to the principle of Davisson, and desiring to change it into a machine in accordance with the Nesmith principle of operation would require, at the very start, that Davisson's frontal reels be taken from their fighting line position and moved clear to the rear. This removal of the reels has removed Davisson's twisters. Therefore, twisters must be provided, say some slotted gear system. Davisson's cross-heads will not be needed and, furthermore, must not be present, for they would be in front of and interfere with the twister gears. Throw them away. Twisting has now been provided for, but there will be rear entangling twists putting a stop to the operation of the machine after one twist has been made. Twist-preventing mechanisms must be applied in the rear regions.

"And Mr. Wiles states that, in his opinion, the Nesmith patent represents the nearest approach in the prior art to the machine of the Davisson patent."

Referring to the two *Sedgwick* patents, he says (*p.* 218):

"Little need be said about these machines in view of the de scription I have given of them in considering the Kitselman

fabric and in view of the fact that they fall into the same old class with the Nesmith machine involving essentially a series of slotted gears to do the active twisting; woof reels to the rear of those twisters; rear twisting conditions which will be fatal if not provided for; and rear twist-preventing mechanism greater in complexity and cost and bulk and need for power than the twisting mechanism itself. The general analysis which I have just applied to the Nesmith machine will apply equally as well to the Sedgwick machine. In changing the twisting system of Sedgwick to the twisting system of Davisson only the woof reels would be of any practical utility. The Sedgwick machines, like the Nesmith machine, merely serve to illustrate the bold departure effected by Davisson. He throws away most all of the old parts pertaining to the twisting and by very few parts in novel relationship produces a simple machine, wonderfully simple compared with the old ones, having new mode of operation and capable of new results.

"I have, therefore, in considering the Kitselman fabric, explained that Mr. Wiles was mistaken about the capacity of the Sedwick machine, and have explained the peculiar twin fabric which the machine would make. I am acquainted with Mr. Sedgwick and he is a client of mine at the present time. His machines are operated in Detroit by a company. I here produce a catalogue of the Detroit Fence & Wire Goods Co., 'Manufacturers of the celebrated woven wire fence', and suggest that it be marked 'Sedgwick Catalogue.' The fabrics generally shown are simple netting, but on pages 4 and 8 will be found illustrations of the Sedgwick twin netting consisting of an upper fabric and a lower fabric breaking joint on an intermediate wire."

Referring to the *Whitehead* British provisional specification he says (*p.* 218):

"This exhibit has been heretofore referred to and somewhat analyzed in its mechanism. The machine set forth is good for nothing for any useful purpose, for reasons which I have already explained. But if it would do the work intended and operate in the proposed manner it would merely illustrate the general old type of machine comprising twisters at the front; woof reels at the rear of the twisters; rear twisting conditions; and rear machinery to take care of these rear twists. It has split gears to act as twisters. It has no single lement of Davisson, not even the woof reel. Davisson cut loose from all such things as splits gears and slotted gears and rear reels and rear twist-preventing

mechanism. This so-called British patent is not a patent at all, but merely a provisional specification, as it is termed in the British Patent Office, and no patent would issue until the matter was completed, and the heading states that it was not completed."

Referring to the *Smith* British provisional specification he says (*p.* 219):

"This so called patent is not a patent at all, but only a provisional specification which was never completed. Out of its abundant vagueness it can be understood that it is proposed to use split twisters. This of itself would differentiate a construction from that of the Davisson patent. Again, it refers vaguely to 'side segments traveled to and from to form the twist,' a system of twisting certainly not like Davisson and not recognizable as being like anything else found in the art as disclosed in the present record.

"The above are all of the prior exhibits considered by Mr. Wiles as having a bearing upon the Davisson patent,and it seems to me that none of these exhibits, nor all of them taken together, would have any effect in materially limiting or qualifying the invention exhibited in the Davisson patent and recited in the second and third claims thereof."

No other prior exhibits are referred to by defendants' expert as having any effect on the Davisson.

Not only does the Nesmith specification fail to mention, or the drawing to show, any lateral shifting of the spools or spool stands, the drawings exclude the supposition that the reel stands rest in the slots of the gear or have any lateral movement therein (see Fig. 3, where, if the construction were like defendants' model, the ends of the reel stands would be visible in the slots of XX), while the drawings appear to represent them as attached to studs on the face of the gear (see Figs. 1 and 2). The description indicates that only the wires enter the slots, and the phrase of the sixth claim, which defendants propose to interpret as suggesting that the stands move in the slots, when read in connection with the specification and drawings, is apparently merely an awkwardly expressed reference to the fact that the gears are to receive the ends of the stands, and the slots to permit the sliding of the wires.

The certified full-size drawing of the Nesmith patent, put in evidence by complainant, shows clearly (as the copy of Nesmith patent introduced by defendants does less distinctly) that the stands did not project into the slots. The patent shows the shifting mechanism to

extend across the axes of each of the twisting gears except that of the outer border, excluding absolutely the theory that the intermediate gear was perforated for warp wires, since the machine as shown would be inoperative with such wires inserted. Not only does the patent fail to show or mention any hollow spindle with a cross-head carrying reels for wire on opposite sides of said spindle (as called for by the Davisson patent), it shows no spool carriers of any kind on opposite sides of any central wire, but does show features which positively exclude such constructions. It is immaterial whether, with a different plan suggested by subsequent patents, it can be so reconstructed as to admit central wires, or how easy the mechanical task of reconstruction becomes when the plan is furnished. It would not affect the validity of the Davisson patent if the exact mechanism shown in defendants' model were exhibited in the Nesmith patent, for it (even when disorganized from the machine whose feeding or untangling mechanism it purports to represent) does not embody the Davisson invention and would not suggest it without other instruction than is afforded by the Nesmith patent.

As organized in the Nesmith patent it is incapable of twisting mesh of any kind. As reconstructed in this partial model it is incapable of twisting mesh until brought into co-operation with elements of different function from those with which it co-operated in that machine, so as to give to the slotted gears an office which they did not have in the Nesmith machine.

Assuming the author of the Nesmith patent to have been an ingenious inventor only emphasizes the significance of the fact that he did not perceive (what, in the light of complainants' patent, seems so obvious to defendants' expert) that all his feeding or untangling machinery and all the mechanism required for driving it could be dispensed with by substituting for his slotted twisting gears, JJ of his patent, a spindle projecting forward from these gear wheels, carrying a cross-head, mounting the spool-carriers on each side of that cross-head and transferring them from one cross-head to the other to form the mesh. If he had, there would have been no occasion for the expenditure of his ingenuity in contriving this mechanism for taking out the twist or preserving the parallelism of the mesh wires in the rear of the twisting gear. Subsequent inventors, such as Sedgwick, also failed to perceive this and expended their ingenuity upon expensive contrivances to deal with this rear twist. It is idle to argue that what these inventors did not perceive was so obvious that it required no invention. Defendants' expert has endeavored to make it appear that this "feeder," without which it would have been impossible for the twisting mechanism of the Nesmith patent to have performed its office in forming the mesh, was only intended as a reducing mechanism. This is in direct defiance not only of the

terms of the patent, but of what is shown in the drawing. The specification nowhere suggests that it is intended for the purpose of reducing the width of the mesh. On the contrary, it says:

> "The principal and main features of novelty of my invention consist in the principle of the revolving of the wires parallel to each other at the same time they are being twisted, and the other parts and movements of my machine to produce the effects hereinafter described."

The drawings show that there was no occasion for this expedient in order to reduce the size of the mesh, for the breadth of the spools in the feeding mechanism is not equal to the radius of the twisting gear. With the construction shown in the Nesmith patent, including this feeding mechanism, the mesh cannot be brought closer together than twice the diameter of the gear which rotates the twisters J. In complainants' machine, and in the defendants', the mesh corresponds to the diameter of the gear which rotates the twister, and this can be made larger or smaller, according to the character of the work to be done. The Nesmith twisters are incapable of making any mesh, whether narrow or broad, without the concurrent operation of the untangling mechanism, called the "feeder" in the Nesmith patent, "revolving of the wires parallel to each other at the same time they are being twisted."

Nesmith, by substituting the simple and economical Davisson invention for all his cumbrous machinery (expensive to build and expensive to operate, if operative at all), could have made either finer or coarser mesh than that for which his machine was built.

Provisional specifications like the Whitehead and the Smith are in England (like caveats in this country), filed for the purpose of showing that the applicant is at work upon an invention, or expects to make one. They frequently show nothing more than that the applicant has some vague idea which he is endeavoring to work out. If subsequently followed up by completed applications for patents, they serve as evidence of the stage of progress which the invention had reached at the date they were filed. They carry no implication that the applicant has yet conceived of an operative machine, and no assurance that his ideas are capable of being worked out into practical form. The Smith provisional specification (which defendants' expert erroneously speaks of as a patent) contains no drawing and no description of any machine. It conveys no information from which anybody could construct a machine or from which it can be inferred that the author had any concrete conception of how it was to be constructed or operated. Its entire indefiniteness has been taken advantage of by defendants' expert to imagine a construc-

tion the material features of which he evidently borrows from the patents in suit. The real significance of this provisional specification, and of the fact that it was never followed up by a completed application, is that the author (not having, like defendants' expert, the benefit of complainants' patents to guide him) was quite unable to work out and properly associate the elements necessary to give practical operativeness to his nebulous plan; and it is quite immaterial whether his indefinite expressions are or are not capable of being applied to any of the modern machines. They do not define or exhibit or communicate to the public any operative machine or and invention whatsoever.

The Whitehead provisional specification (which also was never followed up by a patent) did exhibit enough of the machine proposed by its author to show conclusively both that it did not contain the invention of either of the patents in suit and that it was not an operative machine for any purpose; it was a conception utterly incapable of practical operation. Evidently its author discovered this before he reached the point of filing a completed specification. Its fundamental incapacity has been explained in evidence. (*Dep. See, R., pp.* 198-203; *p.* 250, *A.* 42-47; *dep Dayton, p.* 283.)

It is significant that defendants' expert has to admit that he has never seen any of the prior machines and has no knowledge concerning them except what is given in the patents. (*R., p.* 172, *X-Q.* 11.) Defendants' counsel, in cross-examination of complainants' witnesses, brought out the fact that they had never known of any machine corresponding to the Nesmith being built or put into use. (*Dep. See R., p.* 255, *X-Q.* 62; *dep. Dayton, p.* 311, *X-Q.* 16, *and p.* 330, *A.* 72-3.) Defendants' counsel undertakes to supply the lack of such proof by introducing into a cross-question a biographical sketch of a John Nesmith taken from "American Annual Cyclopædia and Register of Important Events of the Year 1869," (apparently one of the sort of publications in which anybody who will pay for the space can insert a sketch of himself or of any friend) which gives a very eulogistic account of John Nesmith from the time he "commenced life a poor boy" until he completed it, having "offered a rare illustration of what an active intellect may accomplish, aided by courage and fixity of purpose, and animated by the principles of truth, justice and honor." (*R., p.* 311.) But it nowhere mentions this patent or states that he ever built or operated any machinery corresponding to it. It describes many enterprises in which he was engaged, entirely foreign to this line of business, and the only reference in the entire biography to this art is found in one sentence, as follows, (*R., p.* 312):

"Several of his discoveries and inventions were of great importance and value—among others the well-known machinery for making wire fence and shawl fringe."

There is nothing in this to indicate either that reference was had to the machinery of this patent or that he or anybody else ever constructed and operated any such machinery, and if there had been it would not be competent evidence. It is such an expression as a biographer might use without reference to whether the machinery had ever been constructed or operated, and it certainly gives no indication that it was machinery corresponding to this patent.

Evidently defendants searched the country for evidence to show the practical use of this machine, and failed to find any.

Novelty.—Kitselman Patent.

The nearest approach which defendants' expert claims to find in the prior art to the Kitselman patent is the same Nesmith patent already referred to under a prior title (*dep. Wiles, R., p.* 174, *X-Q.* 21), and the fact that this contains no approach to or suggestion of either the Davisson or the Kitselman invention would seem to be sufficiently apparent from what has been already said. There is nothing in the Nesmith patent which could be converted into the invention recited in either of the claims of the Kitselman patent, or into any approximation thereto, without entirely destroying its identity, and nothing which could suggest this invention or serve its purpose. I have, under the title of "The Patented Inventions" and "Infringement," referred to the departure from the prior art represented by this patent, which constituted a new machine of distinct character from any machine preceding it and introducing a new industry.

Mr. See, after referring to some of the reasons why prior machines were incapable of field use and to the originality of conception and inventive faculty required to produce a machine adapted to weave the fence *in situ* (*pp.* 223-224), takes up each of the prior patents cited by defendants' expert and explains their essential dis similarity.

Concerning the *Whitehead* provisional specification he says (*p.* 224):

"A provisional uncompleted specification instead of a patent, as I have before explained, and a machine full of blunders and quite incapable of any useful operation whatever, as I have here-

tofore pointed out. A machine with split gears to act as twisters, the warp wires coming to these twisting gears from reels at the rear and requiring rear mechanism to prevent rear entanglement. Mr. Wiles is of the opinion that here is where Kitselman's shifters came from. Kitselman's specific shifters, and the shifters of Whitehead, are analogous in that both are long pieces with segmental notches and arranged as reciprocating shifters in a netting machine. But the offices are quite different. Whitehead's shifters are incapable of shifting anything. But, assuming that they would do what they were intended to do, they have not the performance of Kitselman's twisters. Whitehead employs split gears and split wheels constituting his intended twisters, and when his shifters shift the half gears they have shifted everything of the twisters, including all of the bearings of the twisting mechanism. Kitselman, in performing his shifting, leaves the main portions of his twisters in their fixed positions and deals exclusively with the side sections carrying the woof reel. Whitehead's shifting board contains his twister bearings. Take these shifters away and you remove the twister bearings *in toto* and all the twisting mechanism becomes dismantled. Kitselman's twisters pertain to side sections only. Remove them entirely, and you have only dismantled the machine as regards the side sections of the twisters, the main central portions of the twisters still remaining in normal position and unaffected. Kistelman's shifters are separated from each other and are quite uninterfered with by the warp wires being woven in the fabric. Whitehead's twisters, best seen in Plate 2, Fig. 1, are joined together face to face, and their shifting movement would be fatally interfered with by warp wires, and their presence would prohibit the presence of warp wires. The shifters of Kitselman are found in a different type of machine, are different in construction, different in relationship to other parts, are associated with distinctly different parts, they have a different mode of operation and bring about a different result."

Concerning the *Nesmith* patent he says (*p.* 224):

"Mr. Wiles expressing the opinion that it was no invention to take the twisting gears of Nesmith and substitute them for the rack movement of Davisson. Kitselman has not done this. All of Nesmith's gears are slotted, and the gears found in the twisting machine, the only gears of direct interest, have the woof wires passing through the slots in

them, transfer mechanism, in the way of wedges, forcing the wires from the slots of one gear into the slots of another. And these gears are forward of the reels, in the twisting field, and themselves form the twisters. Kitselman has not taken these gears, but, on the contrary, has distinctly discarded them in every sense of their funtional characteristic, location and performance. Kitselman has no slotted gears at all, and no gears in front of his reel, and no gears in the twisting field, and he does not employ gears as twisters. He has not substituted Nesmith's gear for Davison's rack, but has discarded Davisson's rack and retained Davisson's gears, simple plain gears, and retained them in the Davisson location to the rear of the reels, and has retained for them the Davisson office of transmitting orbital motion to the woof reels. But he has set Davisson's twisters further apart and has enlarged the gears so that they will directly intergear with each other.

"Mr. Wiles seems to think Kitselman's twisters are more like Nesmith's than like defendants' twisters. This is obviously wrong. Kitselman's twisters are simply reels and reel carriers for the woof wires, and perforated central portions for the warp wires, and that is precisely what is found in defendants 'machine while in Nesmith's the reel and reel carriers have nothing whatever to do with the twisters or twisting operation, the twisters being slotted gears far in front of the gears, and the twisting being done solely and entirely by those gears. Mr. Wiles thinks Nesmith the nearest anticipation of Kitselman. It seems to me that Nesmith is about as far as possible from Kitselman. Nesmith does not present an element of Kitselman, Nesmith's twisters not being sectional twisters, but being single slotted gear twisters; Nesmith does not twist by means of the reels and reel carriers, but solely by slots in the gears. Nesmith has not his reels in the field of twisting, but, on the contrary, has them his reel in the field of twisting, but, on the contrary, has them far back in the rear where additional machinery is needed to take care of rear entanglement. Nesmith cannot intertwist two woof wires and twist them around a warp wire like Kitselman. Nesmith cannot make the Kitselman fencing. Nesmith cannot make netting *in situ*, nor is the principle of construction of his machine adaptable, by any conceivable modification, to such use."

Concerning the two *Sedgwick* patents he says (*p.* 225):

"I cannot be sure that Mr. Wiles allies anything found in Sedgwick with the Kitselman patent, further than as to the

fabric, which matter I have heretofore considered. But there is a point or two in Mr. Wiles' deposition which may have been intended to apply to the Kitselman patent. He states that the transversely slotted wire shifters of Sedgwick might be adapted to the Nesmith machine, thus permitting the presence of intermediate warp wires in Nesmith if the twisting and feeding gears were only drilled to pass the wires, and also as justifying the modifications defendant has put into the model of Nesmith's feeder. But this, however, seems hardly pertinent to the Kitselman patent, which has no shifting wedges to separate the wires, transversely slotted or otherwise, nor has Kitselman any conditions calling for attack on the wires, in effecting the transpositions of the wires.

"Mr. Wiles speaks of the Sedgwick machine as transferring the spools back and forth. The expression 'the' spools might lead to the inference that all of Sedgwick's woof wires were on shifting spools or reels. None of them are on any shifting spools or reels concerned in the twisting operation, the twist being effected solely by slotted gears, the reels being to the rear and arranged with mechanism to prevent rear twists. But only half the woof wires are carried on moving reels, one woof wire of each pair coming from a stationary reel, the rear twist being prevented by moving one of the woof wires and its reel in an orbit around the fellow woof wire coming from a fixed reel."

Concerning the *Smith* provisional s[illegible]cation he says (*p.* 226):

"A provisional uncompleted British specification, as heretofore explained. Its suggestions are vague and shadowy beyond the point of comprehension. The foundation structure of the machine or machines to which its suggestions are intended to apply cannot be comprehended or reasonably suspected from anything found in the specification or found in the concurrent art. Mr. Wiles appears to be of the opinion that the Nesmith machine might be taken, and, as I understand it, modified somewhat according to the teachings of the Whitehead British patent, and then be further modified according to the vague suggestions found in this Smith British patent, with the result of producing something of interest in connection with the present art. This hardly needs traversing. Nesmith twists exclusively by means of slotted gears; Whitehead twists exclusively by means of split gears; how Smith twists is not explained; we are told only a word or two, but about split gears Kitselman has no split gears or slotted gears, and does not twist by means of gears or wheels, but twists by means of the reels and the reel

carriers themselves brought right into the twisting field instead of being located at the rear of the twisters proper, as in Nesmith and Whitehead, and, so far as can be understood, in Smith.

"Mr. Wiles states that this provisional specification 'contains a brief description applying exactly to the Kitselman structure.' I cannot concur in this, for I do not think that the British patent can be said to contain a description intelligently applicable to anything, the language being too brief, vague and uncertain to have definite meaning. The language is obviously intended for suggestions applicable to the then current art, and we can find in the old art no machine to which the suggestions would appear satisfactorily applicable at all, and it would appear that Mr. Wiles, as mentioned in the paragraph above, has only been able to suggest a composite construction formed by an inconsistent mixture of Nesmith, Whitehead and Smith, the result being a machine which, whatever else it may do, is as far removed from likeness to Kitselman as are any of the specific elements of the mixture taken singly, the machine of the mixture still employing split twisting with reels to the rear of them and requiring rear twist-preventing mechanism, instead of abandoning *in toto* the twisting gear system and putting the reels in the twisting field direct."

Concerning the effect of the Davisson on the Kitselman he says (*p. 227*):

"The only reference Mr. Wiles appears to have made to Davisson in connection with the Kitselman patent is in expressing the opinion, as I understand it, that the Davisson machine would infringe the Kitselman patent if defendants' machine would. In my opinion, the Davisson machine is clearly distinguishable from the Kitselman invention in just those respects of the absence of features which fit the highly important Davisson system of twisting to adaptation for use in portable machines, and in some respects, the merits of Kitselman's improvements on Davisson are susceptible of realization in fixed machines. For instance, the bringing of the central portion of the twisters forward into the plane of the side twisters so that the twister becomes in effect a three-part twister, would be the twisters becomes in effect a three-part twister, would be distinctly advantageous; so also would be the provision for putting the parts into condition ready for shifting by means exclusively of the mechanism which gives the rotary motion to the twisters; and so also would be the direct intergeared driving system in place of the rack; and so also would be the general

fundamental organization resulting in compactness, lightness and portability.

"Attention should be called to one important fact in connection with the Kitselman patent. Kitselman, for the first time in the art, discloses the new Kitselman fabric in which all of the intertwists of the diamonds are around warp wires, all of the elements of the fabric co-operating with each other in giving it structural strength. And Kitselman, in his patent, for the first time in the art, discloses the manner of weaving this fabric by causing the twisters to each carry two reels simultaneously in an orbit around a centrally disposed warp wire whereby the two woof wires are twisted around the warp wire at the same point and intertwisted with each other. And no machine of the prior art was capable of doing this peculiar twisting work or of producing this fabric, with the exception of the machine set forth in the Davisson patent. But, so far as shown by the Davisson patent, that fabric and that manner of twisting, dealing with three wires at once, was not contemplated. The Davisson machine is instantly recognized as fully capable of this work after reading the teachings of the Kitselman patent. Davisson suggested border wires only, and all of his spindles had open centers in order that the border wires could be disposed in any spindle acording to the desired width of fabric. But in such use of the machine no twister ever dealt with more than two wires at once, border twisters dealing with the straight border wires and the twisting woof wire, while intermediate spindles dealt with the two woof wires. Davisson's open spindles were therefore contemplated as carrying warp wires but as carrying border wires only and not as carrying intermediate warp wires to conjoin with two woof wires at a single point of twist. Kitselman's twisters, on the other hand, are expressly stated and shown as carrying not only border warp wires, but also intermediate warp wires at every diamond intersection, and are explained as dealing, not only with two wires twisted together, or one twisted around the other, but as dealing with three wires, two being twisted together and around the third wire. Davisson's patent has the capacity, but is silent as to the use of that capacity and as to the results realized from that capacity. The performance is latent in the Davisson patent. The performance and the result of it is patent in the Kitselman patent. And in Kitselman's patent and in claims thereof the central sections of the twisters are referred to as sections which carry the warp, and as sections which maintain fixed positions in the warp lines while

the woof sections move from warp line to warp line. When the intermediate warp wires are disposed through the twisters it is essential that the central portions of the twisters remain *in situ* at all times and throughout all transpositions of the side sections. In the operation of these netting machines, the work is done by alternating twisters and, at the next step, by the intermediate twisters, half the twisters considered as mere rotators, being idle, while the other half are at work. Thus, referring to Fig. 1 of the Davisson patent, notice that all the work is being done by the outer and central twisters, the intermediate ones being idle and retired. They are retired in an axial direction only, but so far as their present purpose is concerned they might be retired in any direction, or, for the time being, be removed from the machine, to be replaced when the time arrives for their performance in the production of twists. But in the Kitselman machine the intermediate spindles are to carry warp wires, and to support warp wires against the strains being imposed upon them by woof wires pulled upon by the active twisters. There are, therefore, no idle spindles when Kitselman fencing is being made, and the retirement of them would be inconsistent with their performance. It would therefore seem that in the Kitselman patent and claims the three-part twisters are twisters arranged in constant series, all parts having duties in connection with wires, the central parts maintaining at all times their constant location consistent with their dealing with the warp wires, and the side sections being transversely shiftable from one central section to another.

"The Kitselman patent, in all the claims sued on, would therefore appear to be clearly distinguishable from anything disclosed in the prior art, in arrangement of elements, relative perfomance of elements, mode of operation, capacity for field use, and improved character of product."

These comprise all the prior patents to which defendants' expert refers as tending to limit the Kitselman.

See the testimony of Mr. Dayton upon the same subject and to the same general effect. (*R., pp.* 284-295.)

Defendants have bound into their printed record several other patents, which are not referred to by their expert, or offered in evidence, and which, therefore, are not mentioned by any witness, and seem to require no discussion. They are entirely foreign to the invention here under consideration and exhibit nothing which could serve its purpose. Some of them are later than the Kitselman invention. There was nothing in defendants' evidence to give com-

plainants occasion to prove the date of this invention, but defendants' cross-examination of Kitselman disclosed the fact that it was made in 1885 (*R., p.* 95, *X-Q.* 63), and the construction of patterns for the working machine began in May or June, 1886 (*p.* 95, *X-Q.* 61-62). The application was sworn to August 2, 1886, and filed August 13, 1886 (*p.* 356). Where defendant has offered expert evidence concerning alleged anticipations, patents not referred to in such expert evidence are not entitled to consideration. See *Miller* v. *Smith,* 5 Fed. Rep., 359, 363 (Clifford, J.); *Waterman* v. *Shipman,* 55 Fed. Rep., 982, 987 (C. C. A., 2nd C.). Nor can patents issued after complainants' invention be considered. *Bates* v. *Coe,* 98 U. S., 31, 33-4; *Kearney* v. *Lehigh V. R. Co.,* 32 Fed. Rep., 320 (Bradley, J.)

Kitselman Files.

Defendants' expert insists that because during the progress of the Kitselman application certain claims which had been objected to were amended by rewriting them in different terms, the applicant must be understood to have admitted that everything embraced in the claims originally submitted and subsequently amended in this way was old. This is a misconception or misapplication of the decisions on this subject. It is true that where, after rejection, a claim is amended by inserting a specific limitation, such limitation must be given its full effect, and the claim cannot be construed so as to make it inoperative. It is also true that where a claim is struck out and one substituted for it, obviously resting on different elements, the substituted claim cannot be treated as resting on the subject-matter which was thus abandoned. But this is utterly different from the proposition of defendants' expert. Complainants here are not asking to have any of these claims construed as covering either a lesser or greater number of elements than those specified in them, or as resting on different elements, or so as to defeat the effect of their express terms. The action of the patent office in objecting to or rejecting claims as first submitted is purely tentative, generally intended to call attention to machines in the prior art in order that the applicant may either explain the distinction between his invention and those cited, or, if he prefers, state his claims in terms that will more aptly or clearly distinguish its essential characteristics from prior machines. Such references, in the first instance, are frequently given before the examiner or assistant examiner (to whom the application comes in the first instance) has reached any conclusion satisfactory to himself concerning the pertinency of the reference, leaving the applicant, or his solicitor, to point out by argu-

ment or amendment (as he may prefer) the reasons why the reference does not meet the substance of the invention. In examining the references, the applicant or his solicitor, though entirely satisfied that they do not meet the invention as claimed and that the examiner has misapprehended either the application or the prior patent, may choose to express the claims in different terms, not because the claims are substantially met, but because they can be made clearer, or perhaps more comprehensive, or because this is the easiest way to call the attention of the examiner to the material differences between the reference and the invention claimed. Such amendments are usually made by striking out the claims which are to be amended and rewriting them in different terms. If the claims, as thus rewritten are allowed by the office after argument, it is quite as likely to be because the office is satisfied that the reference did not meet the substance of the claim, or because the claim as redrawn excludes a construction which the examiner thought might possibly be put upon it, but which would not be its natural or proper one, as because of any change in the actual scope of the claim. Very frequently such amendments broaden rather than narrow the claim, because the solicitor, on examining the prior art, perceives that the departure made by the applicant warrants broader claims than those submitted before. Frequently the amended claims are neither broader nor narrower than those for which they are substituted, but express more clearly, or in language more in accordance with the taste of the solicitor or the examiner, the same subject-matter, the solicitor insisting by argument (either oral or written) that the references do not meet it. Again, the applicant may be satisfied that the claims already allowed cover his invention sufficiently for his purpose, and strike out those which, in view of others already allowed, seem unnecessary for his protection. In either case he cannot have the benefit of anything covered by claims that have been rejected and withdrawn, *unless it is covered by claims that have been allowed and appear in the patent as issued*, but nothing which is embraced in the claims actually issued is abandoned, whether included in claims which have been replaced by others during the pendency of the application or not. So far as *claiming any right under the rejected claims* is concerned (providing they have not been replaced by others covering the same subject-matter), the effect upon him may be the same as if all that was embraced in them was abandoned, or, in other words, the same as if such claims had never been submitted. But whatever has been fairly included in the claims that are allowed is conceded by the patent office, in its ultimate action, to be novel, original and patentable, and the effect of the allowance of these claims is not defeated by the fact that

claims either more or less comprehensive were submitted during the progress of the application and withdrawn by the substitution of others afterwards allowed. The patent must be judged primarily by what appears in it as granted, its grant being the official act of the patent office, under its seal, while the correspondence preceding its allowance is tentative in effect and to be regarded, like the correspondence leading up to any contract or grant, as superseded by the ultimate grant. It would be as reasonable to say that where, preliminary to a contract, various counter propositions had been made and rejected before agreement was finally reached, everything embraced in clauses that had been stricken out to be afterwards rewritten must be considered as abandoned by the grantee even though fairly embraced under different forms of expression in the grant as ultimately executed, as to apply such a rule to a patent.

The decisions which have referred to the proceedings in the patent office preliminary to the grant of a patent, as explanatory of the significance of the terms used in the patent, have proceeded upon the theory that the meaning of such terms might sometimes be explained by the circumstances under which they were introduced. Even in this aspect, such evidence has to be considered with great caution. The correspondence cannot overrule the terms in which the grant is finally expressed, for the official grant must be taken as the last and decisive expression of the patent office. The rule which prevents a contract from being modified by preliminary correspondence applies with special force in cases where (as in the prosecution of an application for patent) part of the proceedings are expressed in writing and a part, which sometimes determines the language in which the instrument issues, may be oral and not appear in the records. Such files can do no more than explain the significance of the terms of the patent when consistent with such terms. The correspondence of the examiner is preliminary and advisory. His expressions are in no sense "judgments" or "adjudications." The judgment of the *patent office* is not expressed and does not become operative except through the formal grant, properly sealed, signed and countersigned. Until this grant is made, the examiner is at liberty to allow claims practically commensurate with or much more inclusive than those which in the earlier stage of the prosecution he has rejected. See, as explaining patent office methods, dep. See (*R.*, *pp.* 241-243, *A.* 9-10); dep. Dayton (*pp.* 308-309, *A.* 11, 12.)

Some of the claims in the Kitselman patent here in suit are in the exact language in which they were expressed as filed, though their number has changed, and others were amended to express more

accurately or clearly what might have been fairly implied in the claims for which they were substituted. The first claim, as originally drawn, made no reference to the rotary movement of the sectional twisters and no reference to the fact that the central section was to be adapted to carrying the warp wire, or that the shifting sections were to be adapted to carrying the woof wire. In the absence of these definitions, it was rejected on references to prior patents entirely foreign to the present invention, and which defendants' expert has not mentioned as exhibiting any approach to the invention of either claim in controversy, and was amended by specifying these qualities which were fundamental in the invention exhibited but not in terms recited in the first claim as originally drawn.

The second claim underwent no change (except in number) beyond having the words "its axis" changed to *this axis*. It was originally the sixth claim of the patent, and was renumbered as the second (*R., p.* 353.) The ninth claim is *verbatim* as originally submitted, except its number, it having been originally numbered fifteen (*R., p.* 355.) There is in the file-wrapper, as printed, a line drawn through a clause immediately preceding the words "substantially as described." If that were supposed to have been the result of an amendment, it would be in the direction of broadening the claim; but no such amendment appears, and evidently this line is accidental or means that these words were written in the claim and cancelled in the original specification before being filed, so that no change was made in the claim during its pendency in the office. The present tenth and twelfth claims are *verbatim* as originally filed, their numbers having been changed, respectively, from 16 and 18 to those they now bear. (*R., p.* 354, 355.) The eleventh claim (which was originally the seventeenth) underwent no change except to have the words "the central section of each twister being provided with a longitudinal opening for the passage therethrough of the warp wire" inserted before the words "substantially as described" (*R. p.* 355.) The present fifteenth claim was an addition to the claims as originally filed, and when first filed was numbered twenty-one (*R., p* 359.) The only changes it underwent, beside the change of number, were substituting the word "whereby" for the words "and thereby adapted" and inserting the words "are adjusted" after "twister" (*R., p.* 359.) The present twentieth claim was substituted for one which did not contain any limitation to "sectional twisters" or to their being "geared together to be simultaneously rotated on their axes," or to the shifting side sections being "adapted to align with the central sections and to be rotated therewith" (*R., p.* 365.)

Defendants' machine contains all the elements expressed in the claims in suit, and the fact that such claims were allowed after can-

vassing the subject, as was done pending the application, indicates perhaps more clearly the ultimate conviction of the office that the patentee was entitled to all they embrace, than if the application had been allowed in the exact terms in which it was originally submitted.

See in this connection *Reece Buttonhole Ma. Co.* v. *Globe Ma. Co.*, 61 Fed. Rep., 958; *McCormick Har. Ma. Co.* v. *Aultman, Miller & Co.*, 169 U. S., 606.

Novelty—Conner Patent.

Defendants' expert admits that no prior patent embodies the combination of elements set forth in either of the claims of the Conner patent in suit, and when pressed to name the nearest approach to be found in the prior art, refers, *first*, to the Winsor (a patent relating to an entirely different art and which has to be reconstructed upon a plan distinct from what is pertinent to the art in which it is found before it can be converted into anything applicable to the art of weaving mesh fence), and afterwards, under further examination, seems to fall back upon the Davisson or the Kitselman patents, though he is compelled to admit that they do not contain the Conner invention. (*Dep. Wiles, R., p.* 174, *X-Qs.* 23-26.) His real effort is to build up an anticipation by combining and adapting to cooperation with each other, elements selected out of several patents and organized upon a plan drawn from the Conner patent. I think his attack upon this patent is sufficiently answered by the testimony of Mr. See and Mr. Dayton. Referring in order to the prior patents mentioned by defendants' expert, Mr. See says (*p.* 229):

> "Mr. Wiles has found nothing in the prior art constituting an anticipation, but doubts invention and thinks the details could be gathered from the teachings of the prior art. I think the prior patents referred to by him call for but little remark. I refer to these patents separately."

Then, speaking of the Winsor (*p.* 229):

> "This patent has no reference to a netting mechine, but is concerned with a machine for weaving weaver's harness, so-called, being strap-like suspenders consisting of marginal cords forming the warp, and woof threads running straight across and close together and twisted around the warp cords and knotted together in the middle of the width of the strap. The weaving is done with two bobbins traversed across the fabric in sinusoidal paths, each bobbin traversing the entire width of

the fabric, the two bobbins twirling about each other *en passant* at the center of the fabric. The machine has no sort of interest except in connection with the system of guides and impellers by means of which the bobbin carriages are passed to and fro across the fabric in laying the straight woof threads and making the proper twists and knots. The bobbins are incapable themselves of laying the woof and they are supplemented by knotting and tucking fingers lying in front of the bobbins and having complicated motions needless to describe. The sinusoidal paths in which the bobbin carriers move across the fabric are formed by a series of intersecting circles and notched impelling disks, serving in connection with automatic switches to control the to-and-fro and rotary movements of the two bobbin carriers. These paths of motion, and these notched disks, and these switches have, in form, strong analogy to features found in the Conner patent, but beyond form the analogy is lost, for the performance is quite different and the result is quite different. In Winsor there are but two bobbins and they lay the warp directly straight across the fabric. These bobbins are mere spools with their axes parallel with the line of fabric. These two bobbins co-act only *en passant*. There is no provision for dealing with more than two bobbins, or for causing any intertwisting of three wires, nor is there anything in the way of netting capacity. Conner has a multiplicity of hollow spindles in line, adapted to carry a series of warp wires. About these spindles two woof reels can twirl and produce the intertwisting of their two warp wires, at the same time twisting these two woof wires about the warp wire. At the completion of this operation, the switches indicate the direction of transference, whereupon the woof reels redispose themselves into new pairs and repeat the tripartite twisting operation, after which the switches direct them back into their former association of couples, there being no traversing motion of any woof reels across the fabric to produce a squarely laid woof to form a close woof fabric such as weavers' harness. Conner could have gotten nothing from Winsor further than the mere suggestion of a possibly available mechanical movement. The instruments to be dealt with were different, the general conditions were different, the fabric was entirely different, the material to be dealt with was different, the direction of woof was different, there were intermediate warps, the path of reel travel was entirely different, and the period of transfer was entirely different, so that what was found in Winsor would not at all answer the purpose while it might contain useful and happy suggestions on which could be founded a development into

something available. Mr. Wiles seems of the opinion that Conner has merely transferred Winsor's switching system to a machine for weaving diamond netting; that he has simply modified Winsor's system and applied it to a Davisson-Kitselman machine. In view of what I have just above pointed out as to the deficiencies of Winsor, in its adaptability to Kitselman conditions, I am inclined to think that Mr. Wiles is quite wrong and that Winsor could only be looked upon as furnishing a suggestion of a mechanical movement which bore no internal evidence of certain suitability for the radically new situation; and that if this suggestion was followed up and finally developed into suitability for the radically new conditions, purposes, material, fabric and general mode of operation of fundamental machine, it could only be the result of invention.

"Mr. Wiles refers to the Nesmith patent as illustrating, not a machine anticipating Conner, but as a machine having the same results. This is wrong, for it has heretofore been pointed out that the Conner machine would produce the Kitselman fencing, something the Nesmith machine was quite incapable of doing; and Conner in effecting transfers does it by transferring the woof reels themselves and, under the direction of the switches, by the simple rotation of the twisters themselves, while in Nesmith the transfers of the wires are effected by attacking the wires direct by means of wedges which bodily force them from the slots of one twister into the slots of another twister, the twisters themselves taking no part whatever in the transference, and the machines being otherwise unlike in their mode of handling the wires, and their relative simplicity and compactness and their mode of operation.

"It would not seem to me that there was anything in the prior art imposing qualifications or limitations on the Conner invention as referred to in the claims thereof in suit."

Mr. Dayton goes more into detail in explaining the distinctions between the Conner invention and the prior patents referred to by Mr. Wiles and the errors into which Mr. Wiles has fallen concerning them, and I refer to his testimony (*R., pp.* 295-302, *A.* 7) as very fully covering this subject. See, also, dep. Dayton (*R., pp.* 307-308, *A.* 9.)

Novelty—Pope Patent.

When asked, in cross-examination, to name the nearest approach to this patent, which he finds in the prior art, defendants' expert specifies the Kitselman patent. The only other patents he refers to

in this connection are the Morgan, the Meddaugh & Wilcox and the Reppeto. (*Dep. Wiles, R., p. 176, X-Q. 27.*)

This is practically equivalent to admitting that he finds nothing in the prior art corresponding to the invention claimed in the Pope patent for, as already pointed out, the claims of the Pope patent in controversy are predicated upon improvements incorporated upon the Kitselman invention. While the Kitselman patent exhibits a machine to which Pope applied his invention, it does not exhibit the invention claimed in the Pope patent, but only the machine into which this invention was introduced. Mr. See, after some preliminary explanation of the Pope invention and its relations to the Kitselman patent and the advantages which it introduced (*R., pp. 231-233*), points out the distinctions between it and the prior patents referring to defendants' expert, as follows (*p. 233*):

> " He states that stationary spindles were not new in machinery. This is quite true, for wagon wheels have been universally mounted on non-rotary spindles. Non-rotary spindles will also be found about numerous classes of machines dealing with wire, but never under the conditions imposed by the Davisson machine. For instance, in the manufacture of barbed wire, a straight wire or a pair of them have a single wire barb twisted about them. Machines of this class are found in the Ayres & Becker patent No. 235,331; Bates' patent No. 357,653; and Brainard patent No. 277,451, referred to by Mr. Wiles as illustrating stationary spindles. But in those machines the spindles are no more sugestive of adaptability to the Davisson system of wire working than are the spindles of an ordinary buggy, for they carry no reels and deal with no shifting side sections.
>
> " So, also, in the old field picket fence machines, stationary spindles could be found, as indicated by Mr. Wiles, but it is to be remembered that these machines carried no reels and had no three-part twisters or sliding sections, or anything of that kind. They were no more suggestive than the buggy wheel on its stationary spindle.
>
> " Mr. Wiles refers to the Conner patent, and to the Kitselman patent, referring to the latter as the nearest approach to an anticipation of Pope, but it seems to me that in doing so it would have been well to call attention to the fact that the modifications and changed conditions brought about in the Davisson machine by those very patents, were the modifications and conditions which suppressed the outreaching system of Davisson and seemed inconsistent with stationary spindles.

"Winsor's patent No. 306,306 is referred to as an example of a spool holder supported by its heel only as in Pope. In this patent the spool-holder is a spindle on which is mounted the spool of thread forming the woof and it is subject to no forward pulling strain, and it is not carried by the gears or central portions of the rotating mechanism and no two of them ever require to twirl about a warp. There is no scheme of carrying reel frames directly by their rotating gears.

"The Sedgwick patents are referred to by Mr. Wiles as examples of upstanding reel carriers. But he did not point out the fact that these Sedgwick machines did not have reels in the twisting field or engaged at all in the twisting, but that they were far to the rear and concerned only with the twist-preventing mechanism and that they were on no gears and went around no spindles and had no association with spindles or gears.

"Morgan's patent No. 432,951 is referred to. It has rotary spindles instead of stationary ones. It has not woof reels with their axes at right angles to the axes of the twisters; it has not spindles projecting forward beyond the heels of the reel carriers; and it has not reel carriers dependent for support solely upon the rotators which move them in their orbital paths, but, on the contrary, it has reel carriers of a somewhat complicated character engaging in front of and behind the upright of the frame of the machine and supported thereby, the rotators having only the office of turning them in their orbits.

"I do not recognize anything in the prior art as detracting from the invention displayed by Pope in adapting a rigid non-rotary spindle to a Davisson-Kitselman machine under the almost forbidden conditions apparently imposed by both Davisson and Kitselman, and securing to the fullest extent the merits of Davisson's outreaching overhanging system of reels in conjunction with the frontally extended central spindles of Kitselman, at the same time securing a simpler and more rigid construction than either. The prior art would not seem to me to have effect in materially limiting or qualifying the invention of Pope as recited in the claims referred to of the Pope patent."

Mr. Dayton reviews more specifically the prior exhibits and Mr. Wiles' testimony concerning them (*R.*, *pp.*, 303-307), to which testimony I here refer.

Defendants' expert refers to the Whitney patent of October 3, 1893, as showing the invention of the Pope patent (being in this

respect similar to defendants' machine manufactured under the Whitney patent). While this Whitney patent is later in date than the Pope, they were pending in the Patent Office concurrently. Complainants have, therefore, shown (and without contradiction) that the Pope machine, coresponding to the Pope patent, was manufactured and put into use in the field in the summer or early fall of 1892, the invention having been conceived of and the construction of the machine begun in February, 1892, and practiaclly completed in April, 1892, having been photographed in the field in the early fall of 1892, and the photograph sent to the solicitor with a description of the invention November 7, 1892. The date of commencing the machine is fixed by a certain auction, which is shown by record evidence to have occurred February 16, 1892. (*Dep. John C. Pope, R., p.* 255, *A.* 1-23; *p.* 260, *A.* 51-58; *p.* 261, *A.* 1-3; *dep. William J. Pope, p.* 261, *A.* 1-23.) The date of the auction referred to is shown by a certificate of publication, in evidence. (*R., p.* 336.) The photographer who took the photograph of the machine testifies that he took it, he thinks, in 1892; is positive that it was not later than that year, as he left the photograph business and moved away from the place where he conducted it about the 1st of April, 1893. The photograph shows the grass to be in a condition which it could not have reached during any part of 1893 prior to his having moved away, indicating plainly that it must have been not later than the preceding summer or early fall that the photograph was taken. He remembers that it was some time before he went out of the photograph business that this photograph was taken. (*Dep. Sabin, R., p.* 264, *A.* 1-7; *"Complainants' Exhibit Pope First Machine," opposite p.* 339.) A duplicate of this photograph is shown to have been sent to Pope's solicitor in the fall of 1892, and his correspondence with his solicitor at that time, and extending to March 6, 1893, fully describes this invention. (*Stipulation, R., p.* 334, *and correspondence p.* 335.)

Whitney's application, which was made considerably after the Pope machine had been put into the field, evidently adopted this feature from Pope, as he had adopted other features from complainants' earlier patents. Whitney has not undertaken to assert that he made this invention at any time, or that he had embodied it in his machine prior to the time that Pope had it in use in the field, or prior to Pope's application for patent. His practice was (as indicated by the three successive Whitney patents) when he saw a new invention to apply for a patent embodying the same invention changed only in subordinate details.

LAW GOVERNING VALIDITY.

It is quite immaterial whether it be or be not true, as argued by defendants' expert, that certain elements of complainants' patents can be found in one prior structure and other elements in other prior structures, and that the mechanical task of converting prior structures into those of the patent would not be difficult. The *conception of the plan* that was to govern the new organization, of the *utility* and *effect* of bringing the elements into such co-operation, and of the modifications in them and their environment by which they were adapted to their purpose, must precede and underlie the mechanical task, and the evidence for defendants only illustrates and demonstrates the fact that no such *conception* and no such *consummation* is to be found in the prior art. In most of the cases where the courts have sustained patents after considering the question of novelty or patentability, the approaches in the prior art have been very much closer than those to be found in the present case.

In *Clough* v. *Barker*, 106 U. S., 166, a prior device could, by an adjustment of which it was capable without change (but which was not suggested in the prior patent), be made to respond to the terms of the patent in suit and to produce the same result. The supreme court held that this did not constitute it an anticipation or even a limitation upon the scope of the claim, which it construed broadly and upheld. It, at the same time, in *Clough* v. *Mfg. Co.*, 106 U. S., 178, held that the patent under which defendant's device in the former case was made (which covered a construction by which the interior tubular valve of the first patent was dispensed with, and by which the number of parts was reduced, and in which the shell alone revolved), being a less expensive and more convenient structure than the first, made in fewer parts, was valid, and that the complainant in the former suit, who had adopted this modification and whose patent was held to be infringed by it, was an infringer upon this later patent.

In *Consolidated Valve Co.* v. *Crosby Valve Co.*, 113 U. S., 157, if only the language of the claim was to be considered, the prior art corresponded more closely with it than did defendants' structure, but the court looked through the abstract terms to the concrete thing, read the claim as applied to the concrete invention disclosed in the patent, and interpreted it so as to include the defendants' construction, which was governed by a similar plan, though embodied in different form. There, as here, defendants' expert showed how easy it was to read out of the prior patents the device of the patent in controversy, how insignificant and obvious the mechanical changes necessary to secure that result were, and insisted that it re-

quired no invention. The court, holding the patent valid and entitled to a broad construction, said (113 *U. S., p.* 171):

> "Taught by Richardson, and by the use of his apparatus, it is not difficult for skilled mechanics to take the prior structures and so arrange and use them as to produce more or less of the beneficial results first made known by Richardson; but, prior to 1866, though these old patents and their descriptions were accessible, no valve was made producing any such results."

And again, after speaking of the advantages secured by the patent in suit (*p.* 173):

> "This was a problem of the reconciliation of antagonisms, which so often recurs in mechanics, and without which practically successful results are not attained."

Again (*p.* 179):

> "Richardson's invention brought to success what prior inventors had essayed and partly accomplished. He used some things which had been used before, but he added just that which was necessary to make the whole a practically valuable and economical apparatus. The fact that the known valves were not used, and the speedy and extensive adoption of Richardson's valve, are facts in harmony with the evidence that his valve contains just what the prior valves lack, and go to support the conclusion at which we have arrived on the question of novelty. When the ideas necessary to success are made known, and a structure embodying those ideas is given to the world, it is easy for the skillful mechanic to vary the form by mechanism which is equivalent, and is, therefore, in a case of this kind, an infringement."

See *Barbed Wire Patent*, 143 U. S., 275; *Goodyear* v. *Day*, 2 Wall., Jr., 283; *Western Electric Co.* v. *La Rue*, 139 U. S., 601; *Topliff* v. *Topliff*, 145 U. S., 156; *Potter* v. *Creager*, 155 U. S., 597.

In *Krementz* v. *The S. Cottle Co.*, 148 U. S., 566, the patent was on a collar button, and the departure from the prior art was so slight that the court below, adopting the argument of defendant's expert, had held the single step taken by the patentee was one obvious to any skilled mechanic, and would not sustain a patent. The court, commenting on the fact that, obvious as the invention seemed,

the prior patentees evidently had not perceived it, and that it had given the public a useful article, held the patent valid.

In *Wooster* v. *Blake,* 8 Fed. Rep., 429, Judge (afterwards Justice) Blatchford says (*p.* 432):

> "In regard to claim 1, and other features in the patent, much is said, in the evidence on the part of the defendants, and that any mechanic would know enough to do this or that. This is the oft-repeated story in belittling inventions. The invention consists primarily in finding out what mechanical operation is necessary to produce the practical result arrived at. When such operation is hit upon, the mechanical work is easy. It is easy, when the mechanical operation is seen, to say that it was obvious that certain mechanical arrangements would effect it; but mechanical arrangements are tried and tried in vain to reach a practical result, because the mechanical operation which is to effect such result is not yet seen. In looking at the completed thing, the mechanical operation is there; but the inventor, though he knew all about cams and levers, and other mechanical arrangements, did not have in advance before him the coveted mechanical operation."

In order to defeat a patent for a useful improvement the prior patent or publication must exhibit the invention *unmistakably* and with such definiteness as to leave nothing to chance or speculation. It is not sufficient that in the light of the present invention experts can see how earlier patents might be modified to serve the purpose or to respond to the claim, or that, with the purpose once suggested, the conditions or changes necessary to secure the object become evident and require no mechanical skill for their introduction, especially so when the modification is a departure from the evident purpose of the prior patent and requires the conception of a distinct purpose.

See *Atlantic Giant Powder Co.* v. *Parker,* 16 Blatch., 281; *Colegate* v. *Gold & Stock Telegraph Co.,* 16 *Blatch.,* 503; *Seymour* v. *Osborne,* 11 Wall., 516; *Imhaeuser* v. *Buerk,* 101 U. S., 647; *Park* v. *Booth,* 102 U. S., 96.

The inventions embraced in the patents here in suit are much more original and have been more far reaching in their effect than those for which patents were sustained in either of the above metioned cases, or in the more recent cases of *Dubois* v. *Kirk,* 158 U. S., 58; *Hobbs* v. *Beach,* 180 U. S., 383; *Busch* v. *Jones,* 184 U. S., 598; *Carnegie Steel Co.* v. *Cambria Iron Co.,* 185 U. S., 403.

COMPLAINANTS' TITLE.

Two of the patents were granted directly to complainants, the Kitselman and the Pope. The assignments of the Davisson are printed on pages 336, 337, 338, and the assignment of the Conner on pages 338,339, of complainants' record, defendants' counsel having entered into an agreement that the signature might be taken as *prima facie* genuine and copies made by the examiner might be "used with the same force and effect as such originals." (*R., p.* 18-19).

The answer in terms admits that the Kitselman patent and the Pope patent were issued to complainants on the dates they bear. (*R., pp.* 10-12.)

The patentee Kitselman testified that complainants had continued to manufacture under the patents in suit, at Ridgeville, Indiana, since about the time they acquired title and that with the exception of defendants' infringement, and one other which stopped as soon as suit was begun, they had been the exclusive manufacturers of all machines of this character in this country. (*R., p.* 88, *A.* 6-18; *p.* 96, *A.* 72-76; *p.* 99, *A.* 94.)

The first assignment of error in the petition of the Kokomo Fence Machine Co. for *writ of certiorari* alleges that the patentees admit they "had sold portions of the United States under the Kitselman patent." If by "sold" is meant the assignment of exclusive title to make, use and sell, or any assignment that would divest the fee in the patent for any territory, there is neither admission nor evidence that such a transfer has been made in respect to any part of the United States. It is not alleged or pretended that any rights or license of any kind in the territory where the infringing manufacture is shown to have been carried on has ever been conveyed or granted to anybody by the complainants, or that defendants have ever acquired any right or license under either of the patents in any territory whatsoever. The issue raised by this assignment of error is purely fanciful. While the petition purports to be based on difference of opinion between the judges below, this assignment rests upon a point not mentioned in either opinion. If it be presumed that this contention was made below, it is evident that it was found to be so inconsistent with the record that neither of the judges alluded to it. If the petitioner supposed that it had been overlooked, there was abaundant opportunity to call attention to it, and have it considered.

It is elemental law that "a seizen once proved or admitted is presumed to continue until a disseizen is proved." (1 Greenleaf on Evidence, 42.) Where, as here, the patents were admitted to have

been issued to complainants, an infringer who claims no rights under the patents has the burden of both pleading and proving defeasance of title *for the territory in which the infringment has occurred,* if the defense is to proceed on that ground. Until such defeasance is proved, the title originally vested in complainants as patentees is sufficient to entitle them to maintain the suit.

The bill, after showing the complainants vested with exclusive title under the several patents, further alleged

> "that they have retained throughout the ownership and exclusive control of said letters patent, and each of them, except that they have granted in certain localities rights to sell and use said inventions under some of said letters patent (such grants, however, not including the territory in which the above mentioned defendants have been and are carrying on the infringement hereinafter complained of, in which said territory your orators hold exclusive right under said letters patent in all respects)." (*P.* 5.)

It then (*p.* 6) charged the defendants with infringing the several patents

> "at Kokomo, Indiana, and elsewhere in the United States, . . . by manufacturing at said Kokomo, Indiana, and selling and putting into use there and elsewhere in the United States, wire fabric machines copied after your orators' aforesaid machines and embodying in all said machines the inventions embraced and secured in and under said letters patent, respectively."

Defendants admitted the manufacture and sale at Kokomo, Indiana, of the machines in controversy and their advertisement and sale there and elsewhere. (*R. p., 22; stip. and dep. Frederick, A.* 1-24; *p.* 28, *A.* 78-81; *Ward, p.* 104, *A.* 1-3; *p.* 107, *A.* 32-39.)

The answer, after admitting the Kitselman and Pope patents to have been granted directly to complainants avers that—

> "many, if not all, of the machines made and sold by the defendant company which are complained of in the bill of complaint herein have been for use in territory which the complainants have sold under some, if not all, of said letters patent, and in respect to which they have no right or interest whatever in respect to said letters patent so sold as above explained." (*P.* 13.)

If this allegation were proved (and it is not), it would not affect the interlocutory decree, since it would be no justification of the infringement (committed by the manufacture and sale in territory in which it is neither alleged nor proved that complainants ever granted any rights) that some of the machines, or all of the machines, were sold for use in territory in which the complainants had parted with some, or even all, of the rights under the patents. The opinion and judgment of the court of appeals does not touch (and had no occasion to) upon the question whether, if it appeared that any machines were sold for use in such territory, the defendants would be relieved in whole or part from damages in respect to such machines, nor is there any evidence that complainants have parted with any right whatsoever in any territory in which these machines were sold.

If complainants had granted exclusive licenses to sell and use in territory where the infringement was committed, and if such licenses included a right to make, they would have been none the less entitled to maintain suit against infringers who were manufacturing and advertising for sale generally. It would have been their duty to do so for the protection of their licensees as well as their own protection. If the licensees had been proper or necessary parties (as they were not), defendants might by seasonably raising the objection to their non-joinder, have had them brought in, but if they did not properly plead their non-joinder the objection would be waived. The conduct of defendants shows that they were fully aware that the patentees had not granted any licenses for the territory in which the infringement occurred. Complainants are not obliged to prove a negative or to load down records of this kind with evidence about local grants which have no relevance to the question of infringement or to the territory in which the infringement is alleged and proved to have occurred.

Defendants, in the cross-examination of Kitselman, showed (as alleged in the bill) that complainants had granted some local licenses to sell and use under that patent (not in the territory where the infringing manufacture occurred); and that, in some instances, these licenses may have included a right to manufacture (not the exclusive right to manufacture); that they were mere licenses, but exclusive for the locality to which they referred *so far as the right to sell and use* were concerned, and that this was true of any which included the right to manufacture. (*P.* 94, *X-Qs.* 52-57.) But it did not appear either that any of these licenses carried exclusive right to manufacture for any territory, or that they carried any right of any kind in the territory where the infringement was alleged and proved to have been committed, and it did appear that no licensee ever manufactured and that the complainants have been the exclusive manufacturers throughout and prepared to supply the en-

tire market. (*P.* 88. *A.* 6-20; *p.* 99. *A.* 94.) The petitioner now seeks to treat a mere license which gave the licensee the exclusive right to sell and use in certain territory and included the right to manufacture (not the exclusive right to manufacture) as if it were equivalent to an assignment for such territory. If this were true, it would be immaterial, since there is no allegation or evidence to show that any license was granted for the territory in which the infringement is shown to have occurred. But it is well settled by the decisions of this court that a license which carries less than the entire title for the specified territory does not operate as an assignment of title or deprive the owners of the patent of the right to maintain suit against infringers in that territory. *Gayler* v. *Wilder,* 10 How., 477; *Waterman* v. *Mackenzie,* 138 U. S., 252. It certainly does not affect the right to maintain suit for infringements committed in territory where no rights of any kind have been assigned and against infringers who have acquired no rights whatsoever under the patent. All that defendants obtained in this testimony was the statement that some local licenses had been granted, some of which were exclusive "so far as the sale and use were concerned;" that some of these licenses may have included a right to manufacture, and that this is true of some of those which carried the exclusive right to sell and use. None of them carried the exclusive right to manufacture and no manufacturing was ever done under them. (*R., p.* 99. *A.* 94.) It does not appear what the character of these licenses was, or for what term, or that any of them were in force at the time this suit was begun, or that they have been since. They only related to the Kitselman patent. Infringers who claim no right under the patents are not entitled to have violent assumptions made in their behalf to shield them from the consequences of infringement. If there are outstanding licenses and if it should appear in the accounting that any of the defendants' machines have been sold in the licensed territory, it can then be determined what, if any, effect this should have on the extent of recovery. Both the circuit court and the court of appeals, with the entire record before them, evidently found the issue which the petitioner seeks to raise under this assignment of error so clearly against the defendant as to require no discussion of any question of law relative to it.

LIABILITY OF DEFENDANTS.

Under the circumstances exhibited in the bill and the proofs complainants are entitled to a decree against the defendant company, its officers and stockholders, as prayed in the bill. It is shown by the bill and the proofs in support of it heretofore cited that the indi-

vidual defendants (officers and stockholders in the defendant corporation) combined for the express purpose of starting the infringing manufacture, and have individually co-operated for that purpose before and after the articles of incorporation were obtained, the primary purpose of their incorporation being to manufacture and sell the infringing machine. Trespassers cannot shield themselves from the consequences of their acts by incorporation. The nominal capital of the defendant company was fixed at a sum insignificant as compared with the business it proposed to carry on, and such capital is usually paid mainly, if not altogether, in something that has no appreciable value in case of an adverse judgment. There is no reason why the usual rule that tort feasors cannot escape personal responsibility by incorporation should be suspended or abrogated in case of infringement of letters patent. There is no class of property where such an immunity, if it existed, would be more likely to abuse or where the effect would be more destructive to the right of property. If any exception were to be made in case of an incidental infringement by a corporation, without the knowledge or intentional complicity of its officers or stockholders, the present case would not come within such exception. The bill of complaint and the proofs show plainly that preparation for infringement was made by the individual officers and stockholders prior to the incorporation; that the object of the incorporation was the manufacture of the infringing machine, and that this is the only manufacture that has been carried on by it. (*R., p. 22 A.* 1-89.) If upon the accounting it should appear that the defendant company had substantial assets sufficient to satisfy the judgment, no undue prejudice would fall upon individual stockholders from being joined in the decree, and in any event complainants are entitled to an injunction operating against them as well as against the corporation, and an account of the profits they have received, as well as of the damages they have inflicted.

The question whether stockholders in a corporation were liable as infringers for acts done by the corporation was directly presented to Justice Nelson in *Goodyear* v. *Phelps*, 3 Blatch., 91, the hearing being upon motion for preliminary injunction against a corporation and its stockholders individually joined as defendants. After hearing argument by very distinguished counsel on both sides, he decided the question in the affirmative, and ordered accordingly. This was followed in *Poppenhausen* v. *Falke*, 4 Blatch., 493, where, upon motion for preliminary injunction, the same question was presented, the court saying of the individual defendants (*p.* 494):

> "The fact that, as between themselves, they are connected together as the stockholders, managers, and servants of a cor-

poration, does not exempt them from the restraints of an injunction. This is in accordance with the view taken by Judge Nelson in the case of *Goodyear* v. *Phelps.*"

This has been treated as the settled law of the second circuit since that time, and has been generally followed in other circuits, though there are some cases in which the court's attention does not appear to have been called to this line of decisions, in which it has been held that the mere fact that a person was a stockholder in a corporation was not sufficient to render him liable for acts of infringement, in the absence of special circumstances, to which cases I refer presently.

In *National Cash Register Co.* v. *Leland*, 94 Fed. Rep., 502, the circuit court of appeals of the first circuit, after a review of the authorities, held that (*p.* 511):

> "by the general principles of law, and by analogy with other torts, a director of a corporation who, as a director, by vote or otherwise, specifically commands the subordinate agents of the corporation to engage in the manufacture and sale of an infringing article, is liable individually in an action at law for damages brought by the owner of the patent so infringed. As with other infringers, it is immaterial whether the director knew or was ignorant that the article manufactured and sold did infringe a patent."

See, also, *Mitchell* v. *Harmony*, 13 How., 115-137; *Peck* v. *Cooper*, 112 Ill., 192.

In *National Car Brake Shoe Co.* v. *Terre Haute Car & Mfg. Co.*, 19 Fed. Rep., 514, a suit for damages for infringement of a patent, a case in the seventh circuit, where officers of the corporation were joined as parties defendant, Judge Woods, in instructing the jury, referring to the fact that the other two defendants were shown to be officers of the company, said (*p.* 515):

> "All parties who take part in a tort or trespass are liable. A man cannot retreat behind a corporation, and escape liability for a tort in which he actively participates."

This case was cited, among others, in *Cahoone Barnet Mfg. Co.* v. *Rubber & Celluloid Harness Co.*, 45 Fed. Rep., 582, a suit in equity, where Judge Green, of the third circuit, after reviewing the different lines of decisions on this subject, adopted the same view as sanctioned by the better authorities, saying of the rule applied in this case and in *Goodyear* v. *Phelps*, *Poppenhausen* v. *Falke*, *Iowa Barb Steel Wire Co.* v. *Southern Wire Co.*, 30 Fed. Rep., 123, that it seemed the safer rule.

"Its enforcement will render all agents of a corporation who perform acts of infringement, and all stockholders and directors and other officers who, in the conduct of the ordinary business of the corporation, authorize infringing acts, personally responsible to the owners of the patent" (*p.* 584) citing Robinson on Patents, 912.

In *Iowa Barb Steel Wire Co.* v. *Southern Barbed Wire Co.,* 30 Fed. Rep., 123, Judge Thayer, in the eighth circuit, applied the same doctrine, saying (*p.* 123):

"If a corporation is engaged without license in the manufacture of an article protected by letters patent, its acts in that behalf are unlawful, and its managing officers cannot shield themselves from individual liability to an injunction upon the plea that what they may have done was done as officers or agents of the corporation, and not in their own behalf as principals."

In *Armstrong* v. *Savannah Soap Works,* 53 Fed. Rep., 124, where the suit was in equity for infringement of a trade-mark, it was held by Judge Speer, in the fourth circuit, that "the current of authority in this country seems clearly to justify the plaintiff's action in joining the directors," citing *Poppenhausen* v. *Falke* and other cases.

In *Graham* v. *Earl,* 82 Fed. Rep., 155, the circuit court of appeals for the ninth circuit held that the agent or manager of defendant's business was individually liable for infringement committed in that business, notwithstanding he worked for a stated salary and received no share of the profits.

In *United Nickel Co.* v. *Worthington,* 13 Fed. Rep., 392, a suit at law in the first circuit, Judge Lowell held (apparently without examining the decisions heretofore cited) that "an action at law cannot be maintained against the directors, shareholders, or workmen of a corporation which infringes a patented improvement." He concedes that "Joinder in equity for purposes of discovery and injunction is another matter." This decision has sometimes been cited as authority for holding that the officers of a corporation were not liable for infringement, but the doctrine has since been rejected in the first circuit as well as others. (94 Fed. Rep. 502.)

In *Howard* v. *St. Paul Plow Works,* 35 Fed. Rep., 743, Judge Shiras, of the eighth circuit, without citing authority, refused a decree against the officers of the corporation, saying (*p.* 747):

"In cases wherein it appears that the name of a corporation is used as a mere shield or cover for the protection against lia-

> bility of the real parties in interest, or where by reason of the insolvency of the corporation a decree against it would be futile, a court of equity may doubtless entertain a bill and give relief against those by whom the affairs of the corporation are managed, and who, in that capacity, have been active in violating the rights of a patentee."

He was apparently not aware that Judge Thayer, of the same circuit, had in *Iowa Barb Steel Wire Co.* v. *Southern Barbed Wire Co.*, 30 Fed. Rep., 123, above cited, held that officers of a corporation could not shield themselves from liability for infringement upon the plea that what they had done was done as officers of the corporation, or of Judge Treat's decision in the same circuit, hereafter cited.

In *Boston Woven Hose Co.* v. *Star Rubber Co.*, 40 Fed. Rep., 107, Judge Wales, of the third circuit, cites and follows *Howard* v. *St. Paul Plow Works*, citing also Judge Lowell's decision in *United Nickel Co.* v. *Worthington* (since overthrown by the circuit court of appeals for the first circuit, as above stated), *Lewis* v. *Machinery Co.*, 21 Blatch., 184, and *Ambler* v. *Choteau*, 107 U. S., 556. *Lewis* v. *Machinery Co.* gives no countenance to this decision, but, on the contrary, holds in terms that the defendant cannot shelter himself under a corporation which he controls, and is personally liable. *Ambler* v. *Choteau* has absolutely no relevance. A later decision in the same circuit already cited (*Cahoone* v. *Barnet Mfg. Co.*, 45 Fed. Rep., 562), after a review of the decisions, held that officers, directors and agents of corporations who authorize or consent to the use of the patented invention are liable as infringers.

Consolidated Brake-Shoe Co. v. *Chicago, P. & St. L. Ry. Co.*, 69 Fed. Rep., 412, states the law as follows (Allen, J.) (*p.* 414):

> "While it has been frequently held that general allegations of infringement in suits against corporations and officers of corporations as joint tort feasors are sufficient to hold the individual defendants until the entry of a final decree, and especially in cases in which individual defendants should be held, in order that force and effect may be given to any order or decree of the court, whether interlocutory or otherwise, I find in this case an absence of specific proof to the effect that the individual defendants Hook and Henderson either directed the infringement complained of or participated in the profits thereof, and therefore conclude that the bill should be dismissed as to them."

The conclusion seems inconsistent with the statement of law, and it is certainly inconsistent with the principal decisions cited. Every case cited by him in support of his action in dismissing the bill as

to the officers is an authority against that action, with the exception of the New York Grape Sugar Company case, which does not touch either directly or indirectly upon the subject. The passage cited from Walker is irrelevant. Robinson states the law strongly in favor of the individual liability, vol. III, sect. 912.

In *Consolidated Fastener Co.* v. *Columbian Fastener Co.*, 79 Fed. Rep., 795, there seems to have been no proof that the individual in question was connected with the company, either as director or otherwise. The court said (*p.* 801):

> "The court is unable to find any legal proof that Mr. Littauer was connected in any way with the infringement proved,"

and cited *Howard* v. *Plow Works* and *Boston Woven Hose Co.* v. *Star Rubber Co.* (cases already referred to) as authority for dismissing as to him.

Western Electric Co. v. *Home Tel. Co.*, 85 Fed. Rep., 649, is another case proceeding on the authority of *Howard* v. *Plow Works*, without referring to the other line of decisions. The infringement related to a device used on a switchboard in one of the exchanges under the control of the defendant corporation. It does not appear to have been shown that the individual defendants had knowledge of the use of this device or were in any way connected with its use except as they were officers of the telephone company.

In *St. Louis Stamping Co.* v. *Quimby*, 18 Off. Gazette, 571 (5 Bann. & A., 275), Judge Treat, of the eastern district of Missouri, while finding that, as there was no proof of actual profits or damages, the judgment for nominal damages would be sustained, rejected the master's conclusion that the defendants who were stockholders of a corporation would not be liable for damages and profits if they had been proved. The court said:

> "In thus ruling on the exceptions I wish it understood that I do not assent to the proposition that if a few more persons form themselves into a corporation under the Missouri statute, the business of which is a necessary infringement of a patent, they can escape individual liability for the acts done in the corporate name.
>
> "The Missouri statute as to private corporations and the formation of corporations thereunder cannot be interposed as a shield by the corporators to protect them against wrongful acts. Were this otherwise, then the organization of an insolvent or worthless corporation, in whose name the wrong was done, would enable infringers to destroy the value of a patent and escape harmless."

In *Tyler* v. *Galloway*, 21 Blatch., 66, defendants, with one exception, were stockholders in an association which owned the plant where the infringing device had been used. The liability of these stockholders was directly in controversy. Judge Blatchford, in holding them liable both for injunction and account, said (*p.* 67):

> "It is shown that the infringing cheese hoop was owned by the association, and it was used by its agents in making cheese in its business, at its works, for the benefit of its stockholders. Galloway, Durfee and Billings were shareholders. The use aforesaid was a use by each of them quite as much as if there had been a co-partnership without shares of stock, or one with shares belonging to less than seven shareholders in number. The use by each was a tort, and each is liable to be enjoined. What the extent of the liability of each for profits and damages is will be a question to be determined hereafter, after a hearing on the report of a master on a reference for that purpose."

An order was made for an injunction and account against all the defendants except the one who was not shown to be a stockholder. As to him, the court said the bill must be dismissed, but without costs, as he answered jointly with one of the defendants who was held.

In *Cleveland Forge & Bolt Co.* v. *United States Rolling Stock Co.*, 41 Fed. Rep., 477, Judge Blodgett refers to cases where the evidence indicates that the corporation was organized for the purpose of infringment, or where there was an individual purpose on the part of the officers to infringe, as among those where judgment will be entered against the officers for the damages resulting from the infringement by the corporation as well as for injunction.

Robinson on Patents, after referring to the different lines of decisions on this subject, concludes that the line of decisions represented by *National Car Brake Shoe Co.* v. *Terre Haute Car & Mfg. Co.*, is "in harmony with other doctrines of the law," saying of this line of decisions (Vol. III, Sec. 912)

> "Under this opinion, all agents who perfom arcts of infringement, and all stockholders, directors, and other officers who in the prosecution of the business of the corporation authorize them, participate in the infringement and are personally responsible to the patentee."

None of the cases seems to question the proposition that where the corporation is organized for the express purpose of manufac-

turing and selling the infringing machine, and where upon its organization, it enters upon that as its principal or sole business, the organizers and stockholders can not escape responsibility by the fact of incorporation, and may be individually held both for an injunction and an account. The question how far the individual stockholders have profited by the infringement is one which can only be properly investigated after the reference to the master. Until a a decree finding infringement, the complainants were not entitled to disclosure upon this subject, and it would have been considered impertinent and offensive for them to have undertaken to compel any such disclosure. The right to such disclosure is dependent upon the finding of the infringement, and the evidence concerning the actual disposition made of the profits or the relations of the individual defendants thereto are questions for the accounting. The facts, already shown in evidence, that the corporation was organized for the purpose of manufacturing the machine found to infringe; that all the stockholders were cognizant of this purpose; that they were individually notified, immediately upon their starting the infringement, of the adverse rights asserted by complainants in respect to this machine, and thereafter continued the infringement; that this has been the only machine manufactured and sold by them: that the corporation was organized with an extremely limited, nominal capital with this purpose in view, distinguish this from that class of cases where the infringement has consisted in the use of some tool or mechanism having no direct relation to the main business of the corporation, uses which might occur without coming to the knowledge of the officers or stockholders. Whatever profits have been made by the manufacture and sale of this machine have been presumably for the benefit of the stockholders, and the disposition which has been made of them is a question properly arising upon an accounting.

In *Keller* v. *Strauss*, 88 Fed. Rep., 517, where an attempt was made before an interlocutory decree, in a suit for infringement, to compel defendants to disclose the number of machines of the character alleged to infringe made or sold, Judge Lacombe held that complainant was not entitled to disclosures concerning the details of the defendant's business until after infringement had been found and the case referred to the master, and refused to compel the defendant to answer as to the number of such machines made and sold. See, also, *Tyler* v. *Galloway*, 21 Blatch., 66.

SUMMARY.

The inventions embraced in the patents in suit are primary in character and have made a most important addition to the art. They have introduced a new machine of great value. This machine has supplied a want which had not been supplied by any means before. It serves a purpose peculiar to itself. It has, as the direct result of complainants' invention, been brought into very extensive practical use. There is nothing in the prior art which either meets or substantially limits the claims in suit. Defendants' machine responds in terms and substance to claims of each of the patents in suit, having adopted the several inventions which give character to complainants' machine with such formal disguises as usually accompany intentional infringement. The defendants have entered upon their infringement impelled by direct knowledge of the success and efficiency of the patented machine and with the evident intent of appropriating the benefit of these inventions. They not only took the primary inventions upon which complainants' machine is founded, but included each of the improvements incorporated thereon by complainants' later patents. They could not take either of the machines of the prior art, to which their expert points as the closest approaches afforded by that art, and use it in competition with complainants'. None of these prior machines is available for that purpose, or could be made so without changes that destroyed its identity and incorporated a fundamentally different plan of construction governed by a different design. Complainants are entitled to protection against such infringement, to the full extent asked, under the several patents in suit.

It is submitted that the circuit court, in considering the question of infringement, attached undue importance to changes which do not deprive the elements included in the several claims of their essential character and office or destroy their identity; that it did not properly discriminate between improvements which omit, and those which merely supplement, the underlying invention, or relate to other features of the machine; that the court of appeals was right in so far as it found for complainants, but should have gone further and ordered judgment for complainants under each of the patents in suit, and that such judgment should include with the defendant company, its officers and stockholders, as prayed in the bill.

Respectfully,

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